RAILROAD GAZETTE

FRIDAY, DECEMBER 1, 1876.

"Consolidation" Freight Locomotive by the Baldwin Locomotive Works.

We publish this week elaborate engravings for which we are indebted to our enterprising English contemporary *Engineering*. The following comments and description from the same paper, coming from a foreign source, will be of interest in this country:

"The "Consolidation" type of engine, which has become so popular a class in the United States for working very heavy traffic, originated in an engine bearing that name constructed at the Baldwin Locomotive Works in 1866 for the Lehigh Valley Railroad. The "Consolidation" was built to the plans and specification of Mr. Alexander Mitchell, the Locomotive Superintendent of the Mahanoy Division of the Lehigh line, and the engine was intended for the Mahanoy incline, which has a gradient of 1 in 39.7. * * * * * *

It will be seen from our illustrations, and from the table of leading dimensions given on our two-page engraving, that the engine forming the subject of the present notice is of an exceedingly powerful type. The cylinders being 20 in. in diameter with 24-in. stroke, and the coupled wheels 50⅝ in. in diameter, the tractive power is $\frac{20^2 \times 24}{50.375} = 190.6$ lbs. per each pound of effective pressure per square inch on the pistons. The boiler pressure is 130 lbs. per square inch, and with an effective pressure of four-fifths this amount in the cylinders the tractive force exerted would be 19,822 lbs. This force, however, would be equal to about 22.5 per cent. of the load on the coupled wheels, so that it would only be under very favorable circumstances that the adhesion would be sufficient for it to be utilized.

The engine has four pairs of coupled wheels and a two-wheeled Bissell truck at the leading end. The springs of the three hinder pairs of coupled wheels are connected by compensating beams, while the links at the front ends of the springs of the leading pair of coupled wheels are connected by a transverse beam, from the centre of which a connection is made to a compensating beam extending to the Bissell truck. This last-named compensating beam has its fulcrum attached to the cylinder castings under the smoke-box, as shown in Fig. 4. This arrangement of compensating beams causes the engine to be carried, practically, on three points.

As regards the construction of the frame, little is to be said. As will be seen from the engravings, the frame is of the regular bar type adopted in the United States, and there is nothing about it or about the fixing of the cylinders to call for special remark. The link motion is of the ordinary lifting-link type, the motion being communicated to the valves by rocking shafts, as is usual in American practice, and the expansion link being hung from one side only, an arrangement which is very apt to give rise to undue wear. The slide valves have a much longer travel in proportion to their lap—the travel and lap being 5¾ in. and ¾ in. respectively—than is adopted in English practice, and the steam is thus admitted very late in the stroke when the engine is in full gear.

The boiler is constructed for burning anthracite coal, and has an enormous fire-box fitted with the arrangement of water-tube grate of which we have already spoken in previous articles of this series. The dimensions of the grate and heatingsurface of the engine under notice are given in the table in our two-page engraving, and the proportions are as follows:

Ratio of fire-grate to heating surface.	1 : 51.79
Ratio of flue area to fire-grate surface	1 : 6.87
Ratio of least sectional area of chimney to fire-grate area	1 : 17.1
Ratio of fire-box surface to external tube surface	1 : 10.1
Number of internal diameters in length of tubes	73.3

The constructive details of the boiler the patterns of the fittings, and the mode of staying are similar to those of other engines by the same builders, of which we have already given descriptions. We may point out, however, that the present engine well illustrates the extent to which cast iron is used in American locomotive practice. Thus the top of the steam dome, the internal and external steam pipes, the base and top of the chimney, the smoke-box front, the smoke-box door, and the slides at the bottom of the ash-pan, are all of cast iron, as are also the wheels, the coupled wheels having steel tires. The chimney, it will be noticed, has a slight taper, it being 1 ft. 4¼ in. in diameter at the bottom, and 1 ft. 6 in. at the top, while the sparks are arrested by a wire screen within the smoke-box. Two cast-iron pipes enlarged at their lower ends extend from near the bottom of the smoke-box up through this screen, as shown. The blast nozzle is adjustable.

On page 485 of our last volume we gave some particulars of the performance of the engines we have now been describing. It will be unnecessary that we should repeat these details here, but we may refer to two of the performances as enabling the horse power developed by these engines to be approximately calculated.

Thus on one part of the line with a gradient of 76 feet per mile or 1 in 69.5, the usual load taken up by one of these engines is a train of 100 empty four-wheeled trucks, weighing 340 tons, the maximum load being 140 such trucks, and the speed eight miles per hour. Taking the weight of the engine and tender at 65 tons we shall thus have a total load 340+65=405 tons. The resistances may be approximately estimated as follows:

	Lbs.
Friction of engine = 45 tons at 18 lbs. per ton	810
Friction of tender and train = 360 tons at 8 lbs. per ton	2,880
Resistance due to gravity = $\frac{405 \times 2,240}{69.5}$	13,053
Total	16,743

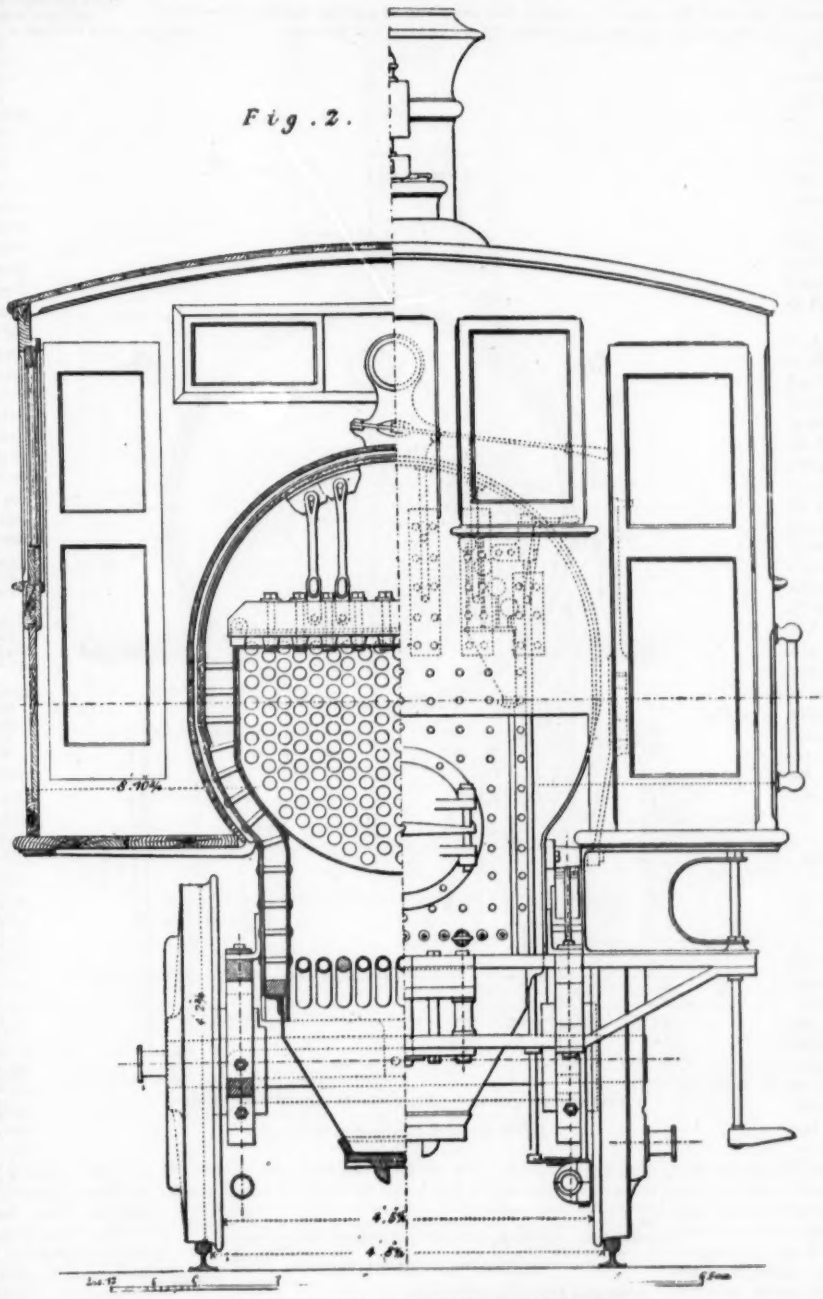
The speed being eight miles per hour, or 704 ft. per minute the work done under the above circumstances is equal to

$$\frac{16,743 \times 704}{33,000} = 357 \text{ horse power,}$$

or one horse power for every 3.6 square feet of total heating surface.

On another division of the Lehigh line between Sugar Notch and Fairview is an incline of 1 in 55, extending for a length of twelve miles, and having curves over the whole length, with the exception of two pieces of straight track, each less than a mile long. Up this gradient the usual load of the "Consolidation" engines is a train of 35 loaded coal wagons, weighing 3 tons 8 cwt. each, and carrying each 6 tons of coal, the total load hauled being thus 329 tons, and being taken up at 12 miles per hour. Adding 65 tons for the engine and tender we have a gross load of 329+65 = 394 tons, and taking the resistances as before, without any extra allowances for the curves, we have in this case:

Fig. 2.



"CONSOLIDATION" FREIGHT LOCOMOTIVE.

By the Baldwin Locomotive Works.

	Lbs.
Friction of engine = 45 tons at 18 lbs. per ton	810
Friction of tender and train = 349 tons at 8 lbs. per ton	2,792
Resistance due to gravity = $\frac{394 \times 2,240}{55}$	16,046
Total	19,648

The speed in this case being 12 miles per hour, or 1,056 ft. per minute we have

$$\frac{19,648 \times 1,056}{33,000} = 629 \text{ horse power,}$$

or one horse power for every 1.96 square feet of total heating surface. These performances are of much interest, and we shall be glad to receive complete details of the fuel consumptions and general working expenses of the engines by which this work is being done.

Contributions.

Performance of Consolidation Engines.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It may interest some of your readers who took any part in the discussion of consolidation engines at the last meeting of the Master Mechanics' Association to learn how these engines are working on our level division.

I send you a simple statement of the amount of work done by two of these engines on the Susquehanna Division of the Northern Central Railway, which division is practically without any grades. The statement shows the actual cost of fuel, repairs, stores and engineers' and train-men's wages, and also shows the work done by the best of the ten-wheel engines which we have working on the same division, with the cost of doing its work.

A simple calculation will show that if the work done by the consolidation engines had been done by the ten-wheel engine instead, it would have cost $1,556.47 more money that it actually did cost with the consolidations.

These figures are all drawn from our regular reports, and no favoritism could have been shown to particular engines by placing men of extra skill upon them, the engines on the Susquehanna Division not being assigned to any particular engineers, but kept at work all the time, and the engineers changed off in regular rotation.

HOWARD FRY, Superintendent Motive Power,
Philadelphia & Erie Railroad Division,
Pennsylvania Railroad.

Statement showing Performance of Pennsylvania Railroad Consolidation Engines compared with 10-wheeled.

	—No. and Class of Engine—.		
	No. 13. Class I.	No. 14. Class I.	No. 26. 10-wheels.
Mileage:			
Of engines.	10,592	9,248	9,852
6 cars on L. B.	704,103	563,884	397,768
Expenses:			
For repairs	$122 86	$168 42	$190 31
" fuel	1,640 42	1,451 62	1,016 71
" stores	57 72	58 22	55 08
" engineers and t'n hands.	1,545 02	1,370 25	1,588 39
Total exp'ses.	$3,396 02	$3,048 51	$2,520 49
Average train, cars	66.5	60.9	40.4
Pounds of coal per car mile	2.3	2.5	2.5

Note.—The car mileage above given is the mileage made by loaded cars plus 3-5 of that made by empty cars.

The statement is compiled from regular reports, and includes a period of four months—May, June, July and August, 1876.

[As some of the particulars in relation to the engines and their performance recorded above were not given in Mr. Fry's first letter, we wrote him for "more light," which is given very clearly in the following letter. It is not necessary to reproduce our letter, as his answer indicates with sufficient clearness the nature of our inquiries. Some remarks will be found on the editorial page in relation to this subject.—EDITOR RAILROAD GAZETTE.]

WILLIAMSPORT, Pa., Nov. 18, 1876.

In reply to your letter of 16th inst. the weight of the Consolidation Engine is about 92,000 pounds, of which about 79,000 pounds is on the driving wheels.

The 10-wheel engine which you show on your tracing represents the standard 10-wheel engine of the Pennsylvania Railroad, and although some of those engines were working on the Division, during the time covered by my letter to you, it so happened that an odd engine of about the same weight but with cylinders of 17×24 instead of 18×22 gave the best results, and I therefore used this engine for comparison. We have no drawings or exact specifications of this odd engine and I cannot tell you the weight of it. It has probably about 51,000 pounds on drivers, but the leading dimensions do not differ very materially, with the exception of the cylinder, from those given on sketch.

With regard to the load of the engine must understand that they were not entered in a competitive trial, but that all three of the engines were working in the regular trade. Every engine is loaded to its utmost capacity when there are cars forit to haul, but owing to the fluctuations of traffic no engine can average anything like its maximum load.

The figures I give of course do not *prove* anything except, perhaps, that the use of very heavy engines on a level road isan experiment worth further trial. Many people imagined that a month's experience would demonstrate the utter unfitness of these engines for anything but a mountain grade. Our experience for six months only teaches us that we can afford to continue the experiment.

HOWARD FRY, Supt. Motive Power.

The Justifiable Expenditure for Improvement in the Alignment of Railways.

BY A. M. WELLINGTON, C. E.

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(Continued from Page 491.)

REDUCTION OF RULING OR MAXIMUM GRADE (CONTINUED).

THE EFFECT OF A DIFFERENCE IN RULING GRADE ON THE COST OF DISTANCE, CURVATURE, AND RISE AND FALL.*

A difference in the rate of the ruling grades has a double effect upon the operative value of alternate alignments, of which we have heretofore considered only one. This separa-

* The article which should properly appear in advance of the present one, viz., "The Relationship and Adjustment of the Minimum Radius of Curvature to the Maximum Grade," is unavoidably postponed, pending the receipt of data which have been promised to the writer and which he desires to include in it.

tion was necessary in order not to confuse two entirely distinct questions, but we will now consider that part of the effect of high gradients which we have heretofore passed over. When the difference in ruling grade is marked, this question frequently becomes one of much importance.

The two distinct effects of high gradients referred to are as follows:

1*st. An increase in the* ENGINE TONNAGE REQUIRED *for a given business.*

This we have already considered and estimated for, in Tables D, E and F, pages 442 and 456.

2*d. An increase in the* DIRECT COST *of every degree of curvature and every foot of distance and rise and fall due to the greater engine tonnage.*

We may best show the importance of this latter item by an illustrative example. Let us suppose that we have two alternate lines, each 100 miles long and with precisely the same amount of curvature and rise and fall; but that the ruling gradients on one line are 40 feet per mile, and on the other line 80 feet per mile. Now the first impression of almost any one would be that, inasmuch as all the details of alignment except the ruling grade are the same on each line, they may be balanced against each other and neglected; and that the sole difference in value between the two lines will be that resulting from the smaller *engine tonnage* required, the value of which may be determined from Tables E and F. But this view is erroneous, for it requires but little reflection to perceive that, inasmuch as more engines must be run over one line than the other, the line having the heavier gradients is more objectionable than the other *in proportion to the amount of curvature and rise and fall which there may be on both the lines alike*, and that hence it may make a very important difference in deciding on their relative values, whether they are lines of heavy curvature and much rise and fall or not.

In order to estimate the importance of this difference, by referring to Table D, page 442, it will be seen that the number of trains required on the line having 80 feet grades will be 40×1.7 =68 per cent. greater than on the other lines, and increasing this percentage by 8 per cent. on account of the great difference in grade, as set forth at the foot of Table D, we have 73⅓ per cent. The *exact* difference, as determined by comparing the relative net loads given in Table XVII., page 442, is 75 per cent., and we will, therefore, use that percentage. Now, it is evident that—to coin a somewhat odd phrase—the number of *train-degrees of curvature* will be 75 per cent. greater on the line having 80 feet grades; and hence that, before instituting a comparison between lines of different grades, the number of degrees of curvature and feet of rise and fall on the line having the higher grades should be *increased by the percentage which represents the excess in engine tonnage required on that line over that required on the given low grade line.* This constitutes the rule by which all such comparisons should be made.†

As respects the effect of *distance* on the comparative value of two identical lines, the correctness of this method is perfectly obvious; and the values of reducing grade given in Table E and F, page 457, have been so given that they do, in fact, vary in proportion to the amount of distance which there may be in each line alike. Thus, if in our illustration above, the two lines had been 120 miles long, the difference in operative value given by the table would have been 20 per cent. greater; and that *this* should be so appears perfectly obvious to every one, because all are accustomed to consider the effect of cost of miles and train-miles. But the exactly same considerations which give a reduction of grade a certain value per *train-mile* of distance give it also a certain value per *train-degree* of curvature and per *train-foot* of rise and fall. For there is a certain cost to operate each degree of curvative as well as to operate each mile of track, and this cost is, in each case alike, increased by an increase of grade. It follows that we might make out tables, similar to Tables E and F, giving the value of reducing grade per 1,000° of curvature, or per 100 feet of rise and fall, similar to those which we have already made out per 100 miles of distance, except that the method we have given above is simpler and better. In estimating for projected improvements on railways *already in operation*, the necessity of separately considering the effect of these various details of alignment on the value of reducing grade disappears, for in that case, the curvature and rise and fall have *already* had their effect—much or little as may be, and just as much as the distance has—to increase those operating expenses by which (as set forth at the foot of Tables E and F) we gauge the value of reducing grade, and hence we are not obliged to consider separately either the one or the other. But in the case of a new road we have not this advantage, inasmuch as we cannot forsee the exact cost of each item of expense, and therefore we are obliged separately to consider the effect of each separate source of expense on the rude estimate of the cost of a train mile under the given special conditions, which we assume in the beginning.

† There is a slight error in this rule, because the *additional* trains on the high-grade line cost much less than the average cost, but this difference is very small in the items *affected* by curvature and rise and fall, and such little error as there is very properly tends to favor the lower gradients.

Now we may proceed further. We have heretofore considered that the two lines were of equal length. But suppose, as would be nearly always the case, they differ in length as well as in ruling grades, as, for instance, instead of two lines each 100 miles long and having 40 and 80-feet grades, that one line is 100 miles long and has 40-feet grades, and the other line is 80 miles long and has 80-feet grades. The value of the difference in ruling grade is given in Tables E and F as so much *per 100 miles of line*, but shall we regard this value as applying to the length of the long line or the short one? The answer is, we may do either by using a little care, but preferably should proceed as follows: The original estimate of the probable number of daily trains will usually be made for the lower line, but for whichever line the *first* estimate be made, the engine tonnage on the high-grade line will be 75 per cent. greater than on the lower, as we have already seen. Then, the low-grade line has, for *eighty* miles of its length, an advantage over the other due to the difference in grade; but it then has the unbalanced disadvantage of having 20 miles further to haul. We may estimate the values of these differences from the tables we have given below:

This is the natural and preferable form of estimation, but we may also assume that the advantage of line A, due to its lower grade, extends over its entire length of 100 miles. But, *in that case*, we must deduct from the value obtained; the value of 20 miles of distance, not on line A, but *on line B*, the high-grade line, which is greater than on line A in (very nearly) exact proportion to the greater number of trains required, or by about 75 per cent. We thus have:

In favor of line A, 40 feet reduction in ruling grade for 80 miles.	
Value (at 7 per ct.) by Table E (page 436) $7,577× 40 feet×80-100=	$242,464
Increased by 8 per cent., for extent of reduction	19,397
	$261,861
Against line A, 20 miles of distance. Value, by Table A (page 389), $3,900×20 miles=	$78,000
Net operating value of Line A over Line B, per daily train..	$183 861
Or, for an estimated business of 10 daily trains	$1,838,610

In favor of line A, 40 feet lower ruling grades for 100 miles.	
Value, $7,577×40×100-100=	$303,080
Increased by 8 per cent., as before	24,246
	$327,326
In favor of line B, 20 miles of distance. Value, as before, $3,900×20×1.75 for increase in No. of trains	$136,500
Net balance in favor of line A, per daily train	$190,800
Or, for a business of 10 trains daily	$1,908,000

The first estimate above is the more correct one. The difference of $69,390 (3⅓ per cent.) is due partly to neglect of decimals, but mainly to the error hinted at above, which is left for the careful reader to chase up for himself. We might easily do so, but fear to make too great drafts on his attention.

Now let us see how much this estimate might be modified by the amount of curvature and rise and fall. We will assume this to be precisely the same on each line, and as follows, viz., 10,000° of curvature (100° per mile on the longer line) and 1,800 feet of rise and fall (18 feet per mile). The Union Pacific Railroad in ascending to Aspen Summit has 84° per mile with very moderate difficulties. The Cincinnati Southern Railway on its heaviest operating division (from Somerset to Hunnicuts) has 22.5 feet of rise and fall and only about 80° of curvature per mile, but as we shall have occasion hereafter to comment on some of the economical aspects of this alignment, we will only add now that this is on a very costly location, with maximums of 60 feet grades and 6° curves. Very many roads of the first class in various parts of the country have three and four times that amount of curvature per mile, and it will be admitted that our estimate is far from excessive.

These figures being assumed, we have already seen that the number of trains required on the high-grade line B is 75 per cent. greater than on line A, and consequently the number of *train-degrees of curvature* on line B will be 10,000° × 0.75 = 7,500° greater than on line A. Similarly the number of *train-feet of rise and fall* will be 1,800 × 0.75 = 1,350 feet greater than on line A. Then, from Tables B and C (pages 402 and 422), we have, in favor of line A:

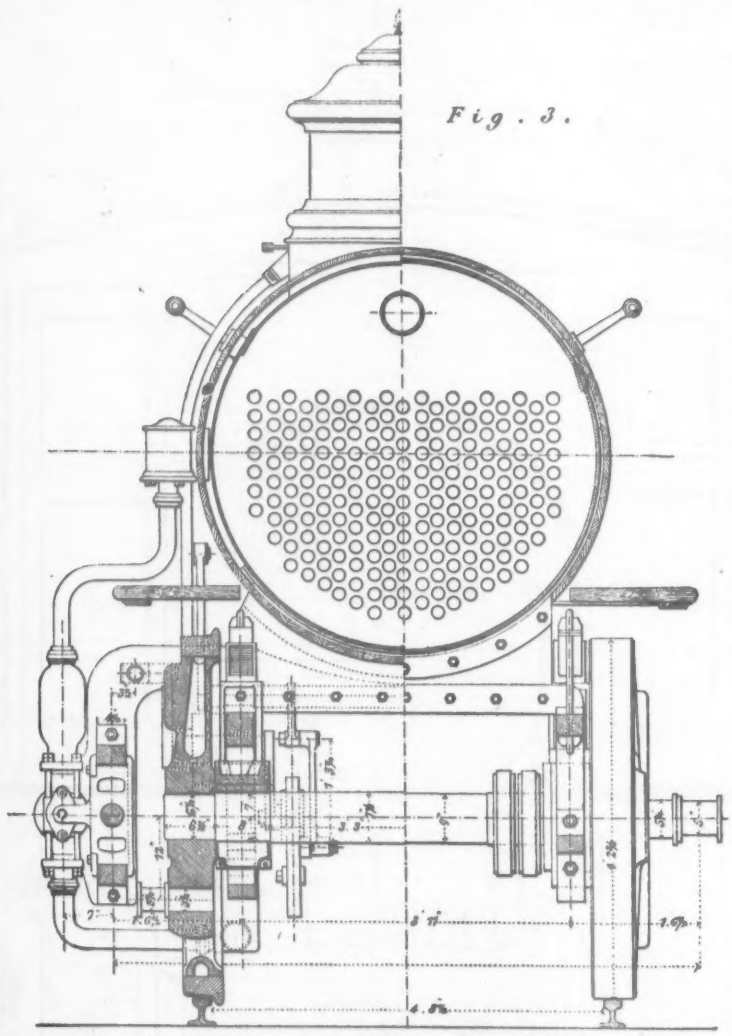
7,500° of curvature × $3.48	$26,100
1,350 feet of rise and fall × $29.71	40,108
Total difference in operative value, due to the above items, per daily train	$66,208
Or, for a business of 10 daily trains	662,080
Total difference previously determined and caused by the difference in distance and train expenses, *independent* of the above items	$1,838,610
TRUE difference in operative value, *including* the effect of an identical amount of curvature on each line	$2,433,850

We will now assume that these two lines were so situated that the rise and fall and curvature were comparatively light, and yet that it still remains the same on each. As a standard we will take 22 miles of the Buffalo Division of the Erie Railway, between Portage Bridge and Burn's Stations, which is perhaps a fair average of a line through moderately difficult farming country, and at points contains much curvature, with maximum grades of about 35 feet each way. The curvature for this distance averages 25° per mile, and the rise and fall 6.3 feet per mile. With these averages we should have on our assumed lines (taking the length of the longer one as before) 2,500° of curvature and 630 feet of rise and fall. The corresponding increase in the value of line A over line B, due to the effect of curvature and rise and fall, would be

2,500° of curvative × 0.75=1,875°, × $3.48=	$6.52⅝
630 ft. of rise and fall × 0.75=472 feet × $29.71=	1,402
Total difference in operative value, due to above items, per daily train	$7,927
Or, for a business of 10 daily trains	79,927
Amount similarly determined above	662,080
Difference in the operative value of line A over line B, resulting from a varying amount of curvative and rise and fall, which still continues to be the same on each	$582,153

making a difference of about 33 per cent. in the original valuation, which neglected the varying disadvantage from the amount of curvative and rise and fall—a sum not unworthy of attention. Yet the reader will admit that this sum was deduced by no strained or forced hypotheses, but by assuming variations which are exceedingly likely to occur in practice. This being so, it well illustrates the necessity of considering and *carefully estimating* every appreciable source of error in adjusting alignment, for every such error is multiplied, in the operation of railways, *by such enormous constants*. In no other branch of engineering is this true to anything like the same extent. Engineers might never have discovered that bridge chords need not be of equal section throughout, and the loss would not have been particularly serious to any one—because it is met and paid for once for all. But suppose that a single important railway has gradients reduced at great expense to an average between those best adapted for its unequal traffic as *has* been done on many railways. It is hardly too much to say that the annual loss from *one* such blunder is enough to pay the interest on the cost of all the bridge chords of all the iron bridges in the United States. And yet the one art—although it is in great degree a matter of well understood routine for ordinary structures—has a voluminous and increasing literature; while the literature of the other is, so far as the writer's knowledge extends and with some inconsiderable exceptions, an utter blank. The consequence is what might be expected. There is no branch of engineering in which there are so many utterly incompetent men who fancy themselves, and are generally thought to be, very expert, as in railway location.

Fig. 3.



"CONSOLIDATION" FREIGHT LOCOMOTIVE.

By the Baldwin Locomotive Works.

THE COMPARATIVE VALUE OF REDUCING THE LENGTH OF THE LINE AND THE RULING GRADES.

Although this question can be solved easily enough, in any given case, in the manner just shown above, there remains another mode which we may briefly consider, viz.: a process of "equating"—a vicious and unsatisfactory method as a rule, but of occasional convenience. For example, when, as is sometimes the case, we may adopt almost any grades at about the same aggregate cost by a proportional elongation of the line, what is the most economical gradient?

We have already seen, on page 389, that the cost of operating one additional mile is 42 cents per train, or $273 per year per daily train. For changes of several miles, however, such as we have now in view, this amount is too small, and should be increased

by about one-third, for the reasons there set forth, giving us $364. Also, we have, by Table E, as the cost of increasing a level maximum grade by one foot per mile, $1,248 for a line 100 miles long, or $12.48 per mile of road. Hence, it is sufficiently obvious that to avoid an increase of one foot on a level grade we may lengthen the line by $\frac{\$1,248}{\$364} = 3.45$ miles. If the line were 200 miles long (and operated as a single division), we might lengthen it by twice that distance; and it is evident that we may say, *generally*, that we may lengthen *any* line having a level maximum grade by 3½ per cent. of its length to avoid an increase of one foot grade; *i. e.*, a line 103.45 miles long with level grades will cost no more to operate than a line 100 miles long with grades of one foot per mile. But it does not follow from this that we can say that a level line 134.5 miles long will cost no more to operate than a line 100 miles long with grades of *ten* feet per mile, or a line 445 long with level grades than a line 100 miles long with grades of *one hundred* feet per mile. When we have to estimate for such considerable changes, the value of distance becomes much increased, and hence our percentage is correspondingly reduced. Therefore, the table which we give below (Table J) and which was deduced in the manner outlined above, applies only to changes of about 20 per cent. or less in the length of the line. Moreover, the percentages given in the table are correct only when we may consider a reduction in grade as having a positive value for every train running over the line. For reasons which have already been set forth (page 436) the writer regards this as a proper assumption in nearly all cases, but if it be not admitted, the percentages given should be decreased in proportion to the number of trains ex-

TABLE J.

SHOWING THE PERCENTAGE BY WHICH ANY LINE MAY BE LENGTHENED, IN ORDER TO REDUCE IT TO A GIVEN GRADE.

For minor changes only, not involving the use or disuse of assistant engines.

Grade after reduction.	Value per mile of avoiding addition to grade of 1 ft.	Value per mile of distance.	PER-CENTAGE.
Level..	$12,480	$364.00	.0345
10.....	9,672	"	.0267
20.....	7,488	"	.0206
30.....	6,240	"	.0172
40.....	5,304	"	.0146
50.....	4,680	"	.0130
60.....	4,368	"	.0120
80.....	3,744	"	.0103
100.....	3,432	"	.0095
150.....	2,808	"	.0077

RULE.—*Multiply the percentage opposite the grade to which the line is to be reduced by the number of feet of reduction involved.* Diminish percentage by 1-6, if over 20 per cent.

cluded. And in addition to this—and more important than all—the table given below must not be considered as applying to *single sharp inclines*, where the relative economy of using ASSISTANT ENGINES is an element of the problem. We shall consider that subject in our next paper, and therefore will now only add that the whole question of the adjustment of gradients is greatly modified when the conditions are such that assistant engines may be economically used.‡

From this table and the remarks preceding it, we may see that the distance by which we may lengthen a line, and consequently the grades to be adopted if they vary with that length, are strictly dependent upon the length of the operating division. For instance, if we have a line about 60 miles long and located under such topographical conditions that for 30 miles of that distance grades of 35 or 40 feet per mile are easily attained, but on the remainder the grades can only be reduced below 50 feet by elongating the line, we may lengthen the remaining 30 miles in order to reduce it to a 40 feet maximum by $60 \times .0146 \times 10 = 8.76$ miles, and if that grade could only be attained by lengthening the line ten miles, we could only afford to reduce the grade to about 43 feet per mile. But if the line had started from a point 40 miles further back in the low country, and hence been 100 miles long, we could have afforded to lengthen the same 30 miles by $100 \times 0.0146 \times 10 = 14.6$ miles, *i. e.*, we could afford to reduce the grades to about 36 feet per mile. In this estimate we take no account of the possibility of using assistant engines nor of breaking up trains or divisions, which greatly modify the problem, as we shall see.

As practical examples of the comparative value of distance and low grades, we may instance, first, the following scrap, cut from the *Railroad Gazette* of Sept. 22, 1876:

"*Cincinnati & Portsmouth.*—The contract for the construction of the entire line of this road from Cincinnati east by south to Portsmouth, O., has been let, and the road is to be finished ready for trains by May 1, 1877. The contract price is about $8,000 per mile. *The line is a pretty direct one, about 100 miles long, and has some heavy grades, one as high as 142 feet per mile.* The road is of 3 ft. gauge."

Now the writer feels a delicacy in commenting on the location of any narrow-gauge road, because he knows so little about them; and moreover, in the course of his present investigations, he has met with several well-authenticated reports of loads hauled on such roads which render it almost certain that the gauge has an effect on the laws of friction and gravitation which science has not yet determined. It is certainly possible, also, that the gradients of the above road could be kept lower and better adjusted on a direct line than by lengthening it. But as a general rule, and for old-fashioned railways, the words "direct line" and "heavy grades" have rarely any business to come into contiguity. If it had been a road of the ordinary kind, the engineer would have done well to go into a few of the calculations which we have been through at such length and discover that he might *well* afford to lengthen his line 5 or 6 miles for every 10 feet of reduction in grade.

As another illustration, we may analyze the justice of a heated controversy which arose in 1864 between the officers of the Union Pacific Railroad on one side and the Government and city of Omaha on the other, with reference to a purposed change of location which was subsequently adopted. The facts were as follows: The original location went almost directly west from Omaha, on a maximum grade of 66 feet per mile, to a point 22.7 miles distant therefrom in the valley of the Platte River. The new location made a detour from this line down the Missouri River for several miles, cutting out 9 miles of the old line and adding 17 miles to it, so that the total distance by the new line to the point in the Platte valley aforesaid was 30.7 miles. From that point westward the grades are 10 feet per mile going west and level coming east for several hundred miles. The grade maximum on the new line going west was 30 feet per mile.

With these premises, the very correct assumption was made that the distance from Omaha to the Platte valley would constitute in effect a separate division, whatever its length might be; and from our own tables, we have, as the comparative value of these two lines (allowing 7 per cent. for capital):

In favor of the new line, 36 feet reduction in grade, to 30 feet.

$$\text{Value, by Table E, } \$8,914 \times 36 \times \frac{22.7}{100} \ldots\ldots = \$72,846$$

Increased by 8 per cent on account of extent of change..... 5,828 — $78,674

In favor of the old line, 8 miles of distance:

Value by Table A, $3,900 × 8..... = $31,200

Increased by 33 per cent. on account of extent of change..... 10,400 — 41,600

Net balance, showing the difference in operative value in favor of the longer and low-grade line, per daily train..... $37,074

The number of trains assumed by Colonel Seymour and by Colonel Simpson of the United States Engineers, in making their estimates of value, was 5 freight trains and 1.5 passenger trains daily over the lower line,§ and multiplying the above sum by 6. 5 for the number of daily trains and by $1.86 for the estimated cost per train mile,

We have	$447,225
By Col. Simpson's and Col. Seymour's estimates, capitalizing the difference in the estimated yearly operating expenses (viz., $174,270 and $151,456) at 7 per cent., we have	$531,730
Deducting from this estimate 22 per cent., on account of 22 per cent. of general and station expenses, inaccurately assumed to vary with the alignment, we should have	$414,750

We see therefore that the adoption of the longer line was unquestionably justifiable, without considering the lower cost of construction or the government subsidy.

Now the rather remarkable identity between the above estimates—estimates made by wholly dissimilar methods as can well be imagined is, the writer begs to add, an entirely unforced coincidence, and was a wholly unexpected discovery after completing the above estimate. He takes this opportunity, however, to point out and acknowledge an exceedingly plausible error into which he has fallen in a previous paper (page 433) viz., an assumption that the value of reducing grade is affected by a variation in the assumed roling friction per ton. Nothing seems plainer than that the rolling friction, which has such an important effect on the *actual* cost of operating a given grade, has an equal effect on the value of reducing it.

Yet this view is wholly erroneous. Whether the car friction assumed be 6 lbs. per ton or 60 lbs., the value of *reducing* grade is not affected a penny's worth, as, in fact, we have already pointed out at the foot of Table F, page 436. Therefore the writer's implied suggestion that Col. Seymour's estimate might have been affected by the subsidy question is not justified by the facts, and he regrets and recalls it. He must add, however, in justice to himself, that in the above error he has the company of Cols. Seymour and Simpson themselves, and, so far as he knows, if every engineer who has ever printed an estimate on the subject; and he may also add that the fact still remains that an erroneous premise was assumed with great care, although it fortunately had no vitiating effect on the *special* problem in view.

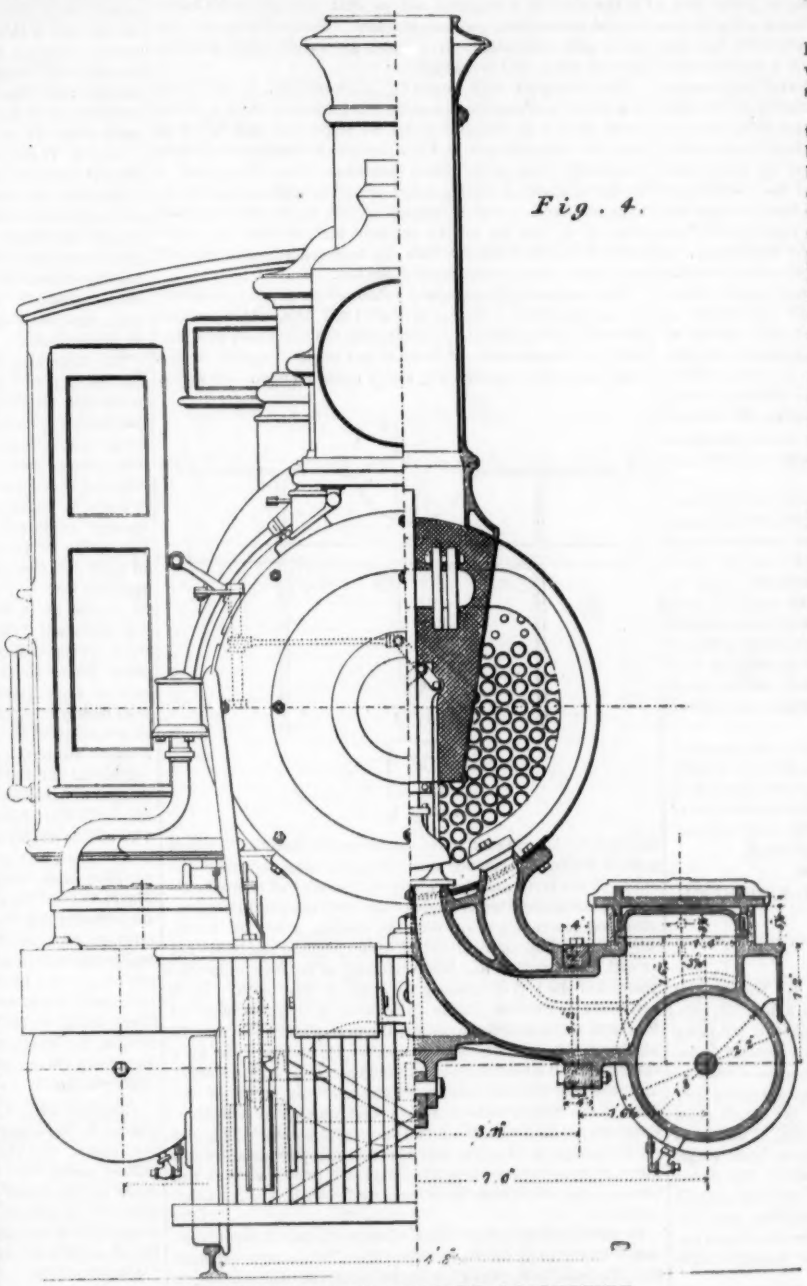


Fig. 4.

"CONSOLIDATION" FREIGHT LOCOMOTIVE,

By the Baldwin Locomotive Works.

Car-Builders' Materials at the Centennial.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Referring briefly to what may be called the show of car-builders' materials at the Centennial, it may be said that it consists rather of the detached and scattered exhibits of manufacturers than of the definite attempt of any one person or company to show what they really prefer and use. You have already noted the interesting exhibit of draw-hooks and buffers in the Belgian department, and these offer about as good an illustration as can be found in the Exhibition of the application of steam or hydraulic power to the forging of medium-sized work. An exact description of the methods employed in making these pieces could be given only with the aid of drawings, but it is useful to observe that though the designers of these parts have failed in some instances to preserve a real simplicity of outline, yet the makers have found it needful to reduce each detail of the process of manufacture to its simplest form in order that the cost of production may be kept so low as to permit such elaborate pieces to be used at all. In some of these particulars an interesting and a very close contest has been maintained between the designer, or the constructing engineer, on the one hand, and the manufacturer on the other, one striving to introduce every conceivable refinement that seemed at all likely to prove useful, and the other to keep the cost down to such a figure as would insure his obtaining a share of the work called for.

It is clear also that there has been a much closer study of the possibilities of variety of design in these general details of car construction abroad than here, but it is by no means clear that any results have been reached of real importance to us as related to our own recognized system of car-building. We certainly cannot go out of our way to introduce the corner buffer,

‡ The writer perceives that these various distinctions which he feels compelled to draw are a tax on the attention of the reader; but he knows of no middle course between careful attention to all these details and blundering on by the rule of thumb. The latter is a very good rule in its place, and we see no reason why—in minor matters, where there is no difficulty nor great expense in keeping on the safe side—it should not always continue to be the convenient friend of the puzzled engineer. But it is a terribly expensive rule for location.

§ That is to say, the estimates were made in another form equivalent to this. The estimate of business has since proved to be excessive, as even at the present day the number of daily trains is only 1.6 passenger trains and 5.2 freight trains. But this was an error which the engineers in question shared with the whole country.

however perfectly it may be conceived and manufactured, and as for the complex axle boxes as shown by some hopeful foreigner, it can only be said that he could himself afford to go a long way to be delivered from the necessity of using them, under any circumstances. The American practice is fully illustrated as a whole in the finished cars, of which there are so many on the ground, and perhaps sufficiently in its details, though, as you have remarked, it is to be regretted that these smaller details of our practice have not been more carefuly collated.

However, the conclusion seems a reasonable one, and warranted by the facts shown, that our current practice of car-building is an art rather than a science; and that although it is a thing which has grown in an admirable way, yet it has not been *developed* in the true sense of the word—that is by minute and painstaking study of the requirements of the case in each particular of detail. Has it not been too much taken for granted, for instance, that plain bar iron and square-headed bolts are the only forms of material that can be put into a freight-car truck frame, and that it is well enough, if not a little better, to *guess* that a cast-iron draw-head is 15 per cent. better than a wrought-iron head rather than to know to a certainty what the fact may really be? No one can deny that the need of a vigorous simplicity of detail has been fairly recognized and largely maintained in our car practice, but it must certainly be admitted that a prolonged study of the facts of the case will yield some improved results. Take as an example, perhaps the best that could be selected, the common draw-bar and its whole plan and method of attachment. The fact that the car-builders themselves do not fully agree about it is evidence enough that it can be improved, even if an occasional pulling out of one and the much more frequent loosening did not furnish any. A very few of these draw-bars are shown in the Exhibition as manufacturers' exhibits, but they offer no new features whatever in design, and none that are specially noteworthy in method of construction. Our own builders, and designers, too, seem to have fallen into as much of a routine in this detail as the foreigners have. It is, however, a rut of a wholly different character, one important item of the difference being ing this, that our whole plan of draft attachments, for freight cars at least, is not nearly as costly as that which answers a similar purpose both as a draw-head and a buffer in the foreign rolling stock.

One of the various elements of this problem in the immediate future of our freight cars is the liability to injury from the jerking and slamming which must arise from the introduction of the gigantic locomotives of the latest type. It may be urged that a transformation in our freight car construction must be had in the early future if the cost of these petty repairs is to be reduced. Similar transformations have already been effected in the locomotives, and in the rails and some other details of the road bed. The general idea of our signal system, or want of system, is now in hand for improvement and advancement on several roads, and the freight car's turn must come before long.

It is probable that what is needed in this case, as in so many others, is more of the insight and comprehension of a really skillful engineer, taking this word in its best and true sense, rather than more of the unassisted energy and perseverance of the mechanic, in whose hands, however, these most excellent results of current practice have been already attained.

THE UNITED STATES INTERNATIONAL EXHIBITION.

XVIII.

MISCELLANEOUS.

NICHOLSON FILE COMPANY, of Providence, R. I. The exhibit of this Company was briefly summarized in a neat little circular distributed by the exhibitors, from which the following extracts are made. The articles shown were exhibited inside of a neat inclosure in which were several glass cases and two principal sample boards, size 6 by 10 feet each, containing files from the regular stock, without extra finish; the small glass case only contained a few files with extra finish. The board with green background showed the leading kinds, from which at least three-quarters of its production of about 700 dozen files per day are called for. The board with red background showed the leading sizes of file steel, in sections; also, file blanks, forged and ground: around the centre are placed the leading miscellaneous kinds, for which the manufacturers have regulars calls.

The exhibit showed the different stages a file passes through before completion, as follows:

Sample, No. 1, Ore, as it comes from the mine. "Palmer."
" " 2, Ore, calcined, or roasted "Palmer."
" " 3, Charcoal iron loop, from Palmer ore.
" " 4, Charcoal iron billet, from Palmer ore.
" " 5, Charcoal iron bar, 2¼ × ⅝, from Palmer ore.
" " 6, The same, cemented or converted.
" " 7, Black lead crucible, containing cemented iron or blister steel, ready for the melting furnace.
" " 8, Cemented iron or blister steel, melted into file cast-steel ingot.
" " 9, File cast-steel ingot, cogged, welded and hammered to finished bar.
" " 10, Samples of file steel ready for the market.
" " 11, File blanks, tanged.
" " 12, File blanks, tanged and pointed.
" " 13, File blanks, annealed.
" " 14, File blanks, ground.
" " 15, File blanks, cut.
" " 16, Files cased, as prepared for market.

This company manufactures what it calls the "increment cut file," the work being all done by machinery. The "increment cut" consists in cutting the file with the teeth closer together towards the two ends of the file than in the centre. When files were first made by machinery, it was found that they were less serviceable than those cut by hand, owing to the fact that the teeth were all made of absolute regularity and uniformity. The points were all of uniform length, so that each one had a uniform bearing on the object to be filed. The effect was that they were less efficient in cutting than hand-made files, in which some of the teeth were less prominent than the others. With a hand-cut file it can be supposed the less prominent teeth would cut grooves and those which projected farther would follow and cut deeper, and so on successively. To produce this effect the Nicholson Company, instead of making the teeth to conform with absolute uniformity to the surface of the file, give to the contour of the former a very slight waving form—so slight as to be hardly perceptible to the eye. This with the "increment cut" gives the teeth a regular irregularity which fulfills the same purpose that is effected by the imperfections of hand cutting.

This company is manufacturing over 600 dozen, or over 7,000. files per day, and manufactures 500 different kinds.

J. P. RICHARDS, of Providence, R. I. In a case inside of the enclosure occupied by the Nicholson File Company, was exhibited an assortment of what Mr. Richards calls the "standard" punches. These are made with a separate stock, which is fitted into the punching machine. The punches are held to the stock by a coupling nut so that one can easily be removed and another put into its place. Some of them are also made with moveable centres, which are easily replaced by duplicates when that is necessary.

THE AMERICAN FILE COMPANY, of Pawtucket, R. I. There was hardly any department of the Exhibition in which a visitor could observe so well and would be impressed so much with what the scientific men call the process of evolution which is constantly going on in different branches of manufacturing. A file seems about as simple a tool or instrument as can well be imagined, and yet it is surprising how much can be learned about them from an expert in their manufacture, as we discovered after an interview with the representatives of the two companies whose exhibits are described.

The American File Company exhibited its goods in a cluster of cases in which it displayed in all 1,482 files, which are also all made by machinery. In perfecting the machinery and processes of manufacture of files, it has made a system of the most elaborate experiments, which occupied about two and a

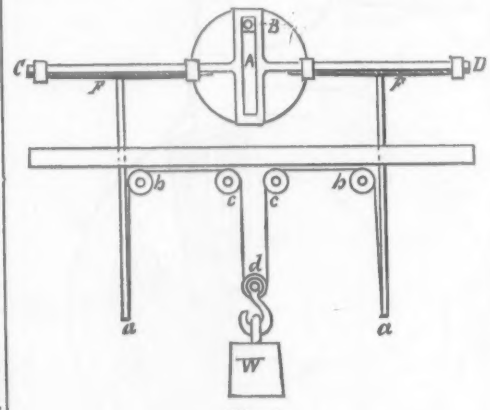


Fig. 1.

half years. Leaving out of consideration the material of which a file is made, its cutting qualities are dependent upon the shape of the teeth and their angle, or "slash," as it is called—that is, the inclination or angle of the rows of teeth to the longitudinal centre line of the file. In cutting a file by machinery, it is laid on an inclined bed whose position can be altered at will. The cutting tool falls vertically on the file, so that the position of the bed determines the angle of the teeth. By a series of experiments, that is, by cutting a large number of files with teeth of different forms, the best shape was arrived at, and in the same way a large number 1⅛ inches wide were cut with the "slash" varying one degree from a right angle until the length of the slash was 2 inches in the width of the file. It can readily be seen what a vast number of combinations are possible with these two varying elements. This was further complicated by the fact that files must be used to cut different materials, such as iron, steel and brass, so that the best *average* result with these three materials had to be determined.

In making such a series of experiments, it was of course necessary to arrive at results as nearly absolutely correct as possible. In order to do this a testing machine was constructed, of which we give in fig. 1 a rough sketch of the principal parts. It consisted of a horizontal reciprocating bar, *CD*, which is worked by a crank, *B*, in the slot *A*.

To the ends of this bar the files, *FF*, to be tested are attached, and bear upon vertical bars, *Fa*, *Fa*, of steel or other material. It should also be stated that the machine is so constructed that the files bear on these bars only during their forward strokes. The contrivances by which this is effected are, however, not shown in our sketch. The vertical bars, *Fa*, *Fa*, which are the objects to be filed, are pushed upward against the files by means of a weight, *W*, which is suspended to a thin steel band or ribbon, *a b c d c b a*, which passes over the pulleys *b*, *b*, *c*, *c* and *d*. It will readily be seen that each of the vertical bars will be pressed upward by the weight, *W*, against the files with a force which will be exactly the same for each. By measuring the length of the bars before the machine is started and then after any length of time, the quantity filed away by each file will give some idea of the relative efficiency of the files, and it can thus be easily determined which one wears out soonest or does the least work. This machine is also used for testing the quality of steel. It will thus be seen that this company has arrived at the processes and methods of manufacture by strictly scientific methods.

The steel used for files is of a lower grade, that is, has less carbon in it, than tool steel, and the files are hardened by heating them in melted lead and then plunging in salt water. This is a very difficult process, as the files must be straightened at the same time that they are tempered, and to do this they must be kept hot enough to bend and at the same time the surface must be kept so cool that the heat will not draw the temper, which is the reason why a lower grade of steel must be used for this purpose.

The machinery employed in the manufacture of files is the Bernot patent.

THE PHOSPHOR BRONZE SMELTING WORKS, of No. 2,038 Washington avenue, Philadelphia. This company exhibited specimens of phosphor bronze ingots and castings of various kinds, such as railroad car-journal bearings, gear-wheels, propellers, etc. This metal has been very extensively used on the Pennsylvania and other railroads for journal bearings. Specimens of bearings were exhibited which had run 200,000 miles under a refrigerator car on the line named.

This material is also manufactured into tubes, wire, wire rope, etc. The wire, it is said, can be made more ductile than copper, and tougher and of greater strength than steel wire. The conducting capacities of the wire for telegraph purposes equals *three* times that of iron wire. It is also rolled into sheets, and in this form it is said that "it is of similar strength to that indicated for wire, and in sea water it loses less than one-half the weight which copper sheets of equal size and weight would lose during the same period of time." A specimen of a bell was also exhibited, but whether its tone was good or not we had no opportunity of testing.

GEO. K. TRYON & Co., of Philadelphia, also exhibited car-journal bearings made of phosphor bronze, and others made of a mixture of copper and tin. The phosphor bronze, as stated above, is largely used on the Pennsylvania Railroad and on the Empire Line cars. The cost as compared with composition is in the proportion of 62 to 100, and it is claimed that experience has shown that the phosphor bronze will wear twice as long as the composition. It seems very desirable that the companies using this metal should give the public some accurate record of its performance.

This firm also exhibit specimens of Babbitt metal composition castings of various kinds, such as journal bearings for steam and street cars, engine truck-axle bearings, connecting-rod brasses, gear-wheels, cross-heads for stationary engines, a gong made of Babbitt metal, valves for marine engines, etc. The castings were all very beautiful specimens of the art, and had that rich color peculiar to good work of this kind.

JOHN A. ROEBLING'S SONS, of Trenton, N. J., had a very attractive exhibit of wire rope of various kinds, showing its adaptation for various purposes. Specimens of iron rods rolled in their mill from which the wire is drawn were shown, and then the wire varying from No. 3 wire gauge = 0.259 in. to No. 36 = 0.004 in. in diameter. From this various sizes of wire rope are made from 1-16 to 3¾ in. in diameter. These latter were arranged very tastefully against a vertical stand and in other places in the space occupied. Copper and brass wire rope of comparatively small sizes were exhibited. These are used chiefly for sash cord and for hanging pictures. As stated above, some of the steel wire, No. 14 = 0.083 in. diameter, had a tensile strength equivalent to 303,500 lbs. per square inch.

A model of a full-rigged merchant ship rigged with wire rope instead of hemp also formed part of the exhibit. A large drawing of the East River Bridge was displayed, and sections of the wire cables employed in the Niagara and Cincinnati suspension bridges, and also another of that which will be used for the East River Bridge. The first bridge has a span of 821 feet. The cables are 9⅞ in. in diameter and are composed of 3,640 iron wires of No. 9 gauge = 0.148 in., and each cable has an ultimate strength of 6,000,000 lbs. The Covington & Cincinnati Bridge has a span of 1,050 feet. Its cables are 12 in. in diameter, consist of 5,180 iron wires of No. 9 gauge = 0.148 in., and each cable has an ultimate strength of 8,424,000 lbs. The East River Bridge will have a span of 1,600 feet. Its cables will be 15⅞ in. in diameter, composed of 6,000 steel wires of No. 7 gauge = 0.180 in., and each cable has an ultimate strength of 22,300,000 lbs.

Telegraph iron, wire rope for the transmission of power and pulleys for the same are manufactured by this firm, and were exhibited. Not the least curious part of the exhibit was the railing, which was composed of the largest wire rope ever made in this country, being 3¾ in. in diameter. It is composed of six outside strands of 19 wires each, which are twisted around a smaller independent wire rope in the centre, consisting of seven wires of smaller size than the others.

Altogether, the exhibit illustrated very thoroughly the various uses in which iron ropes are now employed.

THE WHARTON RAILROAD SWITCH COMPANY, of Philadelphia, exhibited one of their standard switches. These were illustrated and described in the *Railroad Gazette* of Nov. 11, 1871. It also showed a model of the switch with a car to run on it, from which its operation could be shown more clearly than in the full-sized switch. One of J. H. Luken's patent switch stands and levers was exhibited. In this it is necessary for the person who moves the switch from the main track to stand alongside the switch lever and hold it up until the train runs either in or out of the siding. As soon as he lets go the lever, it falls and the switch is set for the main line again.

This company is also an extensive manufacturer of frogs and crossings, of which they exhibit several specimens. These are all made of steel rails which are worked cold in converting them into frogs and crossings. The latter consist first of a wrought-iron bed-plate ⅞ in. thick with flanges turned up at suitable places to receive wedges which hold the rails in position. Where the latter cross each other they are joined by mitred ends, and the guard rails bear against distance pieces which are placed between the guard and the main rails, and all three are then bolted together. The wedges which hold the main rails bear against the flanges of the bed-plate and each is then held in position by a bolt which passes through the bottom of the bed-plate and is secured by lock nuts.

J. C. WRIGHT'S splice or rail joint was also exhibited by thi

company. This consists of a heavy cast-iron bracket placed on the outside of the rail, with a suitable recess to receive a bearing piece of steel, which stands at the same level as the top of the rails and "breaks joints" with them, so that its effect is to make a continuous rail. The joint, however, would be expensive, and its success somewhat doubtful.

WM. WHARTON, JR., exhibited curved steel rails, crossings, frogs and angle crossings of cast iron for street railroads. All the curves and castings for the tracks on Elm avenue at the entrance to the Centennial grounds were furnished by Mr. Wharton. He also exhibited a turn-table 10 feet in diameter for turning horse cars and a rail-bending machine mounted on wheels and intended for curving rails.

THE JERSEY CITY IRON WORKS showed frogs and a switch stand and signal and Newcomb's car replacer. The latter was illustrated in the *Railroad Gazette* of May 5, 1876.

THOS. SHAW, No. 913 Ridge avenue, Philadelphia, exhibited a standard mercury column test gauge, lathe tools, and boring bar. A locomotive exhaust nozzle of peculiar construction was also exhibited. This, instead of consisting of a single pipe was formed of a cluster of small tubes which are intended to project up to near the base of the smoke-stack. Its object is to make the escape of the steam either noiseless or as nearly so as practicable.

NATIONAL TUBE WORKS, of Boston, Mass., and McKeesport, Pa.—The specialty which this company manufactures is wrought-iron tubes, which it makes from 1-16 in. diameter up to 15 in. These comprise lap-welded wrought-iron tubes for locomotive and all other steam boilers; light wrought-iron lap-welded artesian and salt well tubing and casing; plain and enameled steam, gas, water, air and drive pipe; hydraulic pipe, special light lap-welded pipe. Specimens of all these various kinds of pipe were shown. The manufacturers say that they exhibit the largest and heaviest piece of lap-welded hydraulic pipe ever made in the *world*, being 14 in. outside diameter, 14 feet long, and 2 in. thick. This one pipe weighed 4,356 lbs. when taken from the furnace.

Another interesting part of the exhibit was the various kinds of joints employed for uniting the ends of pipes. These include screw couplings, joints made with a flange on the end of each pipe and bolted together, a joint in which the end of one pipe was fitted into the end of the other like a stove pipe and then held together by L-shaped brackets riveted to each pipe and bolted to each other. Another joint had the two ends fitted together in the same way, and space enough was left between the pipes to caulk them with lead; one joint was made in a similar way but with a wrought-iron ring driven in over the joint, and the end of the outside pipe which projected through the ring was caulked like a boiler tube; still another one was made with a cast-iron ring on the end and made with suitable lugs to receive bolts. The pipe projected through this ring and was riveted over, and the two ends then bolted together. A great deal of ingenuity has been exercised to devise various ways for uniting the ends of such pipes.

This company is also the manufacturer of Mack's injector, of which it exhibited a variety. This instrument is too well known to need any description here.

Its exhibit was displayed inside of a structure composed of columns made of wrought-iron pipes with arches, etc., made of the same material, which gave the whole a very massive appearance and was representative of the company's special business.

THE MANSFIELD ELASTIC FROG CO., of New Haven, Conn., exhibited specimens of its railroad frogs. These rest on a wooden base, which gives them the elasticity which is their peculiar characteristic.

JOSHUA WOOD, No. 40 Broadway, New York, also exhibited specimens of railroad frogs.

THE NASHUA IRON AND STEEL CO., of Nashua, N. H., and of Boston, was represented by a display of manufactured steel, including steel tires in the forged state and turned, steel locomotive and car axles, connecting rods, crank pins, cast-steel homogeneous fire-box plates, with specimens of same flanged. They also exhibited a specimen of Woodbury's patent elastic wheel, the elasticity of which is derived from an india rubber cushion placed between the tire and wheel centre.

THE PENNSYLVANIA STEEL COMPANY, of Harrisburg, Pa., displayed specimens of its steel rails made from hammered blooms and subjected to blows from a 2,240 lb. drop falling 14 ft. 6 in. These were of course very much bent, and thus displayed the quality of the material from which they were made. There were also shown short sections of their rails with the fastenings attached, stationary rail steel frog, main line steel spring frog, steel rail crossing, a full sized Lorenz switch, and also a model of the same, steel pinch bars, crank-pins and an all-steel wheelbarrow which had a placard on which it was stated that it weighed 85 lbs. and cost $12. There were also specimens of ores, steel ingots, etc.

THE DIAMOND STATE IRON COMPANY, of Wilmington, Del., had the largest and most complete exhibit of rail fastenings at the Centennial. These consisted of a great variety of fish bars used on various roads in the country, track bolts for same, and then the bars attached by the bolts to sections of the rails, showing the complete joint, railroad spikes bent into a variety of shapes to show their qualities, boiler rivets, hot and cold-pressed nuts, bolt ends and lag screws.

THE PRATT MANUFACTURING COMPANY, of No. 73 Broadway, New York, who are the owners of the patents of the Pratt compensating fish joint, which is manufactured by the Diamond State Iron Company, exhibited this joint in the same space occupied by the latter company. The peculiarity of this joint consists chiefly in an elastic washer, which is composed of a malleable iron cup-shaped part which receives an elastic piece of rubber, on top of which is a flat iron bearing for the nut. By screwing up the nut its pressure bears on the elastic rubber, which prevents its getting loose. This washer is used very extensively, and although more expensive than most other washers, its advantages have been considered fully worth its extra cost. The Pratt Manufacturing Company also deals in all kinds of railroad fastenings spikes and bolts, and exhibit an assortment of these.

THE VULCANIZED FIBRE COMPANY, of Wilmington, Del., and No. 17 Dey street, New York, exhibited various articles made out of a material which they call "vulcanized fibre," which, they say, "is an entirely new article of manufacture, consisting of *vegetable fibre* reduced to a pulp, and then subjected to powerful chemical treatment, whereby the original properties of the fibre are entirely changed and a new and exceedingly valuable material is produced." Now this description makes one feel like the man who, when he asked a person who had but one leg how he lost the other, was told "it was bit off." The description of "vegetable fibre" makes one as eager to ask what kind of vegetables and what sort of chemical treatment they are subjected to as the interlocuter was to know what it was that did the biting referred to.

The company exhibits its material in sheets of any uniform thickness, and to quote again from their circular, "it is made either *hard* or *flexible* as desired. The hard fibre is somewhat like horn in its consistency, is very tough and strong, has remarkable durability under friction, and remains *permanently* elastic under all ordinary conditions of weather or temperature. The flexible fibre closely resembles the best English sole leather in appearance, and is largely used as a substitute therefor in mechanical appliances, but is much closer grained and far more durable, and being of uniform quality and thickness throughout, cuts without waste."

The articles exhibited were ferrules for packing the ends of surface condenser tubes, dust guards and washers for car axle-boxes, fish-bolt washers, gibs for engine cross-heads and also journal bearings, although for the latter purpose it has not been very successful. It is also used for making joints for board car roofs and then consists of strips or tongues from 1-32 in. to ⅛ in. thick, by ½ in. to 1¼ in. wide, inserted in sawed grooves of proper width and depth in the corresponding edges of two adjacent roof boards or planks, which are then driven closely together. It is said that as "vulcanized fibre is insoluble in water, but will swell upon becoming wet, it will readily be seen that should any water find its way between the joints as far as the tongues of the fibre, it will cause it to swell," and thus keep the joint tight.

It is of course obvious that if this material possesses the qualities claimed for it it will be exceedingly useful for many other purposes.

RAILROAD EARNINGS IN OCTOBER.

Name of Road.	Mileage. 1876.	1875.	Inc.	Dec.	Per c.	Earnings. 1876.	1875.	Increase.	Decrease.	Per c.	Earnings per Mile. 1876.	1875.
Atchison, Topeka & Santa Fe	711	563	148	.....	26.3	$285,088	$208,577	$76,511	.....	36.7	$401	$370
Burlington, Cedar Rapids & Northern	401	401	.....	.....	.....	111,441	136,125	.....	$24,684	22.2	278	339
Cairo & St. Louis	146	146	.....	.....	.....	30,510	29,715	795	.....	2.7	209	204
Canada Southern	452	452	.....	.....	.....	156,986	149,552	7,434	.....	5.0	347	331
Central Pacific	1,315	1,315	.....	.....	.....	1,957,000	1,615,973	341,027	.....	21.1	1,488	1,229
Chicago & Alton	650	650	.....	.....	.....	526,406	489,019	37,387	.....	7.6	810	752
Chicago, Milwaukee & St. Paul	1,400	1,399	1	.....	.....	817,569	974,262	.....	156,693	16.1	584	696
Cincinnati, Lafayette & Chicago	75	75	.....	.....	.....	34,045	36,452	.....	2,407	6.6	454	486
Columbus & Hocking Valley	89	89	.....	.....	.....	96,155	99,352	.....	3,197	3.2	1,080	1,116
Denver & Rio Grande	206	120	86	.....	71.7	49,988	29,037	20,951	.....	72.2	243	242
Illinois Central	1,109	1,109	.....	.....	.....	718,740	816,508	.....	97,768	12.0	648	736
Indianapolis, Bloomington & Western	344	344	.....	.....	.....	137,811	137,556	255	.....	0 2	401	400
International & Great Northern	507	459	48	.....	10.5	160,639	155,865	4,774	.....	3.1	317	340
Kansas Pacific	784	761	23	.....	3.0	345,360	356,978	.....	11,618	3.3	441	469
Louisville & Nashville	921	921	.....	.....	.....	513,431	465,266	48,165	.....	10.4	557	505
Michigan Central	804	804	.....	.....	.....	647,210	671,874	.....	24,664	3.7	805	836
Missouri, Kansas & Texas	786	786	.....	.....	.....	335,275	305,144	30,131	.....	9.9	427	388
Mobile & Ohio	527	527	.....	.....	.....	264,507	219,804	44,703	.....	20.3	502	417
Nashville, Chattanooga & St. Louis	341	341	.....	.....	.....	143,525	155,896	.....	12,371	7.9	421	457
New Jersey Midland	86	86	.....	.....	.....	70,163	53,260	16,903	.....	31.7	816	619
Ohio & Mississippi	615	615	.....	.....	.....	341,678	345,805	.....	4,127	1.2	556	562
Paducah & Memphis	115	115	.....	.....	.....	21,240	19,732	1,508	.....	7.7	185	172
Philadelphia & Erie	288	288	.....	.....	.....	387,223	336,034	1,189	.....	0.4	1,171	1,167
Philadelphia & Reading	800	784	16	.....	2.0	1,400,000	1,722,954	.....	322,954	18.7	1,750	2,198
St. Louis, Alton & T. H.—Belleville Line	71	71	.....	.....	.....	50,764	57,351	.....	6,587	11.5	715	808
St. Louis, Iron Mountain & Southern	685	685	.....	.....	.....	440,600	388,604	51,996	.....	13.4	643	567
St. Louis, Kansas City & Northern	504	504	.....	.....	.....	328,508	263,240	65,268	.....	24.8	652	522
St. Louis & Southeastern	349	349	.....	.....	.....	112,916	104,856	8,060	.....	7.7	324	300
St. Paul & Sioux City	122	122	.....	.....	.....	68,066	73,230	.....	5,164	7.0	558	592
Sioux City & St. Paul	148	148	.....	.....	.....	47,596	44,802	2,794	.....	6.2	322	303
Toledo, Peoria & Warsaw	237	237	.....	.....	.....	137,979	127,167	10,812	.....	8.5	582	537
Totals	15,588	15,266	322	.....	.....	$10,688,419	$10,589,990	$770,663	$672,234	.....	$686	$694
Total increase	.....	.....	322	.....	2.1	.....	.....	98,429	.....	0.9	.....	.....

RAILROAD EARNINGS, TEN MONTHS ENDING OCT. 31.

Name of Road.	Mileage. 1876.	1875.	In.	Dec	Per c.	Earnings. 1876.	1875.	Increase.	Decrease	P.c.	Earnings per mile. 1876.	1875.	Inc.	Dec.	P.c.
Atchison, Topeka & Santa Fe	694	514	180	....	35.0	$2,043,473	$1,197,472	$846,001	.....	70.6	$2,944	$2,330	$614	.....	26.4
Burlington, Cedar Rapids & Northern	401	401	....	....	.....	942,675	1,072,695	.....	$130,020	12.1	2,351	2,675	.....	$324	12.1
Cairo & St. Louis	146	137	9	....	6.6	226,052	226,404	.....	352	0.2	1,548	1,653	.....	105	6.4
Canada Southern	452	452	....	....	.....	1,423,731	993,544	430,187	.....	43.3	3,150	2,198	952	.....	43.3
Central Pacific	1,315	1,302	13	....	1.0	15,100,166	14,183,018	917,148	.....	6.5	11,485	10,893	592	.....	5.4
Chicago & Alton	650	650	....	....	.....	4,211,817	3,891,673	320,144	.....	8.2	6,480	5,987	493	.....	8.2
Chicago, Milwaukee & St. Paul	1,400	1,399	1	....	.....	6,679,139	6,580,621	98,518	.....	1.5	4,771	4,704	67	.....	1.5
Cincinnati, Lafayette & Chicago	75	75	....	....	.....	315,763	328,563	.....	12,800	3.9	4,209	4,381	.....	172	3.9
Denver & Rio Grande	164	120	44	....	36.7	384,439	294,037	90,402	.....	30.7	2,344	2,450	.....	106	4 3
Houston & Texas Central	508	508	....	....	.....	2,394,042	2,182,820	211,222	.....	9.7	4,713	4,297	416	.....	9.7
Illinois Central	1,109	1,109	....	....	.....	5,967,601	6,350,030	.....	382,429	6.0	5,381	5,726	.....	345	6.0
Indianapolis, Bloom. & West'n	344	344	....	....	.....	1,355,502	1,073,380	182,122	.....	17.0	3,650	3,120	530	.....	17.0
International & Gt. Northern	464	459	5	....	1.1	1,019,087	986,977	32,110	.....	3.3	2,196	2,150	46	.....	2.1
Kansas Pacific	777	761	16	....	2.1	2,500,181	2,773,032	.....	272,851	9.8	3,218	3,644	.....	426	11.7
Louisville & Nashville	921	921	....	....	.....	4,171,101	3,811,612	359,489	.....	9.4	4,529	4,139	390	.....	9.4
Michigan Central	804	804	....	....	.....	5,708,619	5,480,540	228,079	.....	4.2	7,100	6,817	283	.....	4.2
Missouri, Kansas & Texas	786	786	....	....	.....	2,595,925	2,308,653	287,272	.....	12.4	3,303	2,937	366	.....	12.4
Mobile & Ohio	527	527	....	....	.....	1,508,596	1,367,934	140,664	.....	10.3	2,863	2,596	267	.....	10.3
Nashville, Chattanooga & St. L.	341	341	....	....	.....	1,411,487	1,320,888	90,599	.....	6.9	4,139	3,874	265	.....	6.9
Ohio & Mississippi	615	571	44	....	7.7	3,051,777	2,763,277	288,500	.....	10.4	4,962	4,839	123	.....	2.5
Paducah & Memphis	115	115	....	....	.....	171,412	156,946	14,466	.....	9.2	2,637	2,415	222	.....	9.2
Philadelphia & Erie	288	288	....	....	.....	2,746,786	2,798,718	.....	51,932	1.9	9,537	9,717	.....	180	1.9
St. Louis, Alton & Terre Haute, Belleville Line	71	71	....	....	.....	395,554	460,344	.....	64,790	14.1	5,571	6,484	.....	913	14.1
St. Louis, Iron Mt. & Southern	685	685	....	....	.....	3,046,647	2,875,527	171,120	.....	6.0	4,448	4,198	250	.....	6.0
St. Louis, Kansas City & North'n	504	504	....	....	.....	2,691,998	2,147,539	444,459	.....	20.7	5,143	4,261	882	.....	20 7
St. Louis & Southeastern	349	349	....	....	.....	916,370	813,355	103,015	.....	12.7	2,626	2,331	295	.....	12.7
St. Paul & Sioux City	122	122	....	....	.....	478,001	420,642	57,359	.....	13.6	3,918	3,448	470	.....	13.6
Sioux City & St. Paul	148	148	....	....	.....	298,214	230,586	67,628	.....	29.0	2,015	1,558	457	.....	29.0
Toledo, Peoria & Warsaw	237	237	....	....	.....	1,212,592	882,806	329,786	.....	37.4	5,116	3,725	1,391	.....	37.4
Totals	15,012	14,700	312	....	.....	74,768,689	69,973,633	$5,710,290	$915,234	.....	$4,981	$4,760	$241	.....	4.6
Total increase	.....	.....	312	....	2.1	.....	.....	4,795,056	.....	6.9	.....	.....	.....	.....	....

THE SCRAP HEAP.

The Keystone Bridge Company.

The Keystone Bridge Company has completed the Green River and Bardwell's Ferry bridges on the Troy & Greenfield Railroad in Massachusetts.

It is now erecting the falseworks on which to raise the immense channel span (520 feet) over the Ohio River for the Cincinnati Southern. If weather is favorable, it is expected that the span will be completed by Christmas.

The 300 feet spans of this bridge are finished. The company is erecting the Attica bridge for the Toledo, Wabash & Western and iron bridges on the Evansville & Crawfordsville Railroad and iron bridges for the Galveston, Harrisburg & San Antonio Railroad in Texas, over the Guadalupe, Salado, Cibolo and Tio Geronimo rivers.

Numerous other iron bridges for Eastern and Western railroads and for highways are now under construction in the shops. Forces are also employed in constructing wooden bridges for the Lewisburg, Centre & Spruce Creek Railroad, and erecting an iron bridge for the City of Philadelphia. The contract for the high bridge of the West Chester & Philadelphia Railroad at Media, three spans 157 feet each, and the roof of the Provident Life & Trust Company's new building in Philadelphia have just been awarded this company.

The shops of the company are running double turn with two sets of men. Its new fire-proof building, 40 by 400 ft., is nearly completed. This will so increase its facilities as to enable it to promptly fill its large contracts.

British Rail Exports.

The Board of Trade report shows the following exports of railroad iron of all kinds, in tons:

	1876.	1875.	Decrease.	P.c
Month of October:				
To United States	29	52	23	43.5
To all countries	34,738	40,732	3,004	7.4
Jan. 1 to Oct. 31:				
To United States	579	6,838	6,259	91.6
To all countries	358,873	488,212	129,339	26.4

The average price this year was £8 18s. 4d. against £10 0s. 5d. last year. The average value last October was £9 2s. 0d. The imports to the United States for the ten months have been sufficient for 6¼ miles of track.

RAILROAD GAZETTE

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S. WRIGHT DUNNING AND M. N. FORNEY.

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Editorial Announcements.

Addresses.—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

LONG RUNS FOR LOCOMOTIVES.

This subject has been discussed a good deal of late, and has been practiced long enough to enable some of the railroads which have adopted the plan of running locomotives much greater distances than heretofore without laying up to form some idea of its economy, although thus far we have not been able to procure any data on which any conclusion could be based regarding the relative cost of repairs per mile run on the old system as compared with the new. It was reported quite recently that the New York Central & Hudson River Railroad had abandoned the long runs for their freight engines, owing to the fact that a large number of boilers had been burned and others got into such a bad state of repair that it was estimated the loss incurred thereby would amount somewhere in the neighborhood of $50,000. This we have learned on inquiry is entirely false, and the officers who have the charge of the running of the engines are now more thoroughly convinced of the economy of the long-run system than they were when they commenced. Without having made any very thorough investigation of the subject, we recently made some inquiries in relation to it, and tried to learn what are the specific sources of economy in running locomotives long distances by employing successive sets of men on them. In reply to our inquiries it was said in the first place that either the distances which locomotives were run twenty years ago was too great then, or else they are too little now, because since that time the great improvement in the construction of locomotives has been in the strength and proportions of their parts, so as to secure greater endurance and wearing capacity. By a process of the survival of the fittest we have learned the weak points in the different parts of locomotives: it has been found which parts break oftenest, and which wear out soonest, and the first have been made stronger and the latter have been provided with larger bearing surfaces, and better material or appliances for "taking up" the wear, so that the modern locomotive, unlike its builders, has very much greater endurance than it had when the present generation of active railroad men commenced their careers. Not only has this been the case, but there has been a very great improvement in the tracks on which the engines must run. Instead of having light rails laid on ties imbedded in mud, which shifted and altered their position with every change in the weather, and where, owing to bad drainage, a locomotive was to some extent obliged to be an amphibious creature, they now run on much heavier rails, made of material of much greater strength and resistance to wear, and laid on ties imbedded in a foundation of semi-elastic rock. It therefore might be considered by a simple process of reasoning that locomotives now must be able to run further than those of twenty years ago did or could. Whether those who have adopted the system of long runs arrived at that conclusion by such a process of reasoning, or whether it was the result of the much surer method of personal observation, we do not know; but at any rate, the conclusion seems to be a perfectly sound one, and thus far practical experience appears to confirm that opinion.

On the Hudson River Railroad the freight engines formerly ran 141 miles per day and averaged about 25 days per month, thus making 3,525 miles per month. At present the same engines run 282 miles per day and average about 28 days per month, thus making 7,896 miles per month, or a good deal more than double the service performed heretofore. Now it is obvious that when this system is employed either only about half the number of engines will be needed, or a given number will do twice the work. Considering the enormous amount of capital invested in locomotives by our railroads, the reduction in the capital account which is thus possible is very important, and undoubtedly will be a source of great saving to railroads, provided that there is no other offset or expenses which will be incurred equal to this saving.

If, too, one half the number of engines will do a given amount of work, and they are on the road or in the service twice as long, then it is obvious that there will be only *one quarter* as many in the engine houses, so that a very important saving will be effected in what are generally called "round-house" hands, that is, persons employed in cleaning, in firing up, and in turning engines on the turn-table and running them into and out of the houses. Besides this, there is a loss due to firing-up engines every time they are allowed to cool down. This may be shown by a very simple calculation. A locomotive boiler holds about 5,000 lbs. of water when in working condition. If this be allowed to cool down to a temperature of 60 degrees it will require 1,436,000 heat units to raise the water to a temperature of 247.2 degrees, which is that of steam at a pressure of 130 lbs. Now a pound of average bituminous coal contains 14,701.6 units of heat, or rather, that quantity of heat will be evolved by its combustion. It is safe to say, though, that under the ordinary conditions of "firing-up" only half that quantity of heat will be imparted to the water in the boiler, so that it would require about 195 lbs. of coal to fire up an ordinary locomotive. This calculation is made entirely without any experimental data. Any master mechanic might try it practically, and either confirm the correctness of the calculation or show that it is erroneous. There is undoubtedly a very large material consumption of fuel due to the cooling off of an engine and then heating it up again, which, taken in connection with the labor required to do the firing, etc., will amount to a considerable item, the amount of which we are not able now to give.

Those who do not favor the long-run system say that when the engines are kept so constantly at work it is impossible to give them that careful inspection which is needed to insure their being kept in good condition, and that when they are kept so constantly on the road many minor repairs must be neglected for the want of time to attend to them. Then, too, when this system is employed it is necessary to put the engine in charge of different sets of men. Now it is said that when this is the case men lose their pride in their engines—it might almost be called affection—and that when an engine falls into the hands of different persons they cannot become acquainted with the minor defects and peculiarities of the machine. Now although this sounds plausible, and, as it involves an an emotional element, it appeals more or less to one's human nature, yet when it is cooled down and the truth sifted out we are inclined to believe there will be nothing but a sentiment left. It may be that it will cost less for repairs if an engine is placed exclusively in the care of one man, *but how much less?* Will the difference pay the interest of the increased capital required and the additional labor needed in the engine houses and for the fuel consumed in firing up? If it does not, then the long-run plan is the most economical even though it may cost more to keep locomotives in repair if it is employed.

But something may be said in favor of the long-run system if regarded in relation to the cost of repairs. The cost of the latter may be divided into two classes, those which are due to unavoidable wear and tear, and those which are due to defects in material or workmanship. Now it is obvious that the risks of the latter increase in proportion to the number of engines employed. To illustrate this, suppose that by the new system twenty-five engines are employed to do a given amount of work. Now these engines will have 100 crank-pins. By the old system say fifty engines are required with 200 crank-pins. Now crank-pins often break from defects in their material or manufacture. It is obvious then that there will, in all probability, be twice as many defects in 200 crank-pins as there would be in 100. The same principle applies to wheels, tires and other parts of the engine, so that this class of what may be called accidental repairs would be increased in proportion to the number of the engines employed and not bear any relation to the work done. It may of course be true that men will be careless when this system is first introduced, but salutary discipline ought to correct this evil.

We have heretofore called attention to the danger of estimating the economy of working locomotives by comparisons of only one or a few items of train expenses. On another page will be found a very interesting and valuable paper by Mr. Howard Fry, Superintendent of Motive Power of the Philadelphia & Erie Railroad, giving some data taken from the practical operation of the line with which he is connected, showing the relative economy of heavy consolidation engines compared with lighter ones with ten wheels. From his statement a calculation will show that the train expenses per car per mile were 0.633 of a cent with the ten-wheeled engine, whereas with the heavier consolidation engine they were only 0.508 of a cent, or very nearly 25 per cent. more in the one case than the other. As so few railroad companies keep or report their car mileage, it is difficult to know what it costs them or to make comparisons with the above figures; but it may be roughly stated that train expenses are about one quarter the whole expenses. Of course the advantage of hauling large trains can only be realized on eight trains when there are sufficient cars to load the engines, but assuming that it is applicable to only one half the trains, the reduction shown by Mr. Fry might be made on one half of the train expenses, which would be equal to one eighth the total expenses, so that there would be a saving of 25 per cent. on that one-eighth, which would be equal to over three per cent. on the whole cost of operating. Now we of course have no means of verifying Mr. Fry's figures, and he himself does not regard them as final, and doubtless some drawbacks must be counted in, or, rather, deducted, such as increased repairs for the larger engines; but as three per cent. on the operating expenses of a road like the Lake Shore, which are about ten millions of dollars per year, would amount to $300,000, we can agree most heartily with Mr. Fry that the experiments are worth continuing.

Such facts as these, taken in connection withthe economy which it has been indicated can be effected by long runs, shows that the cost of transportion is probably yet far from being as low as it will ultimately become. It also indicates the enormous disadvantage which a large railroad company will be under if its officers do not study this subject with the greatest care and ability.

INVESTIGATION OF TRANSPORTATION EXPENSES.*

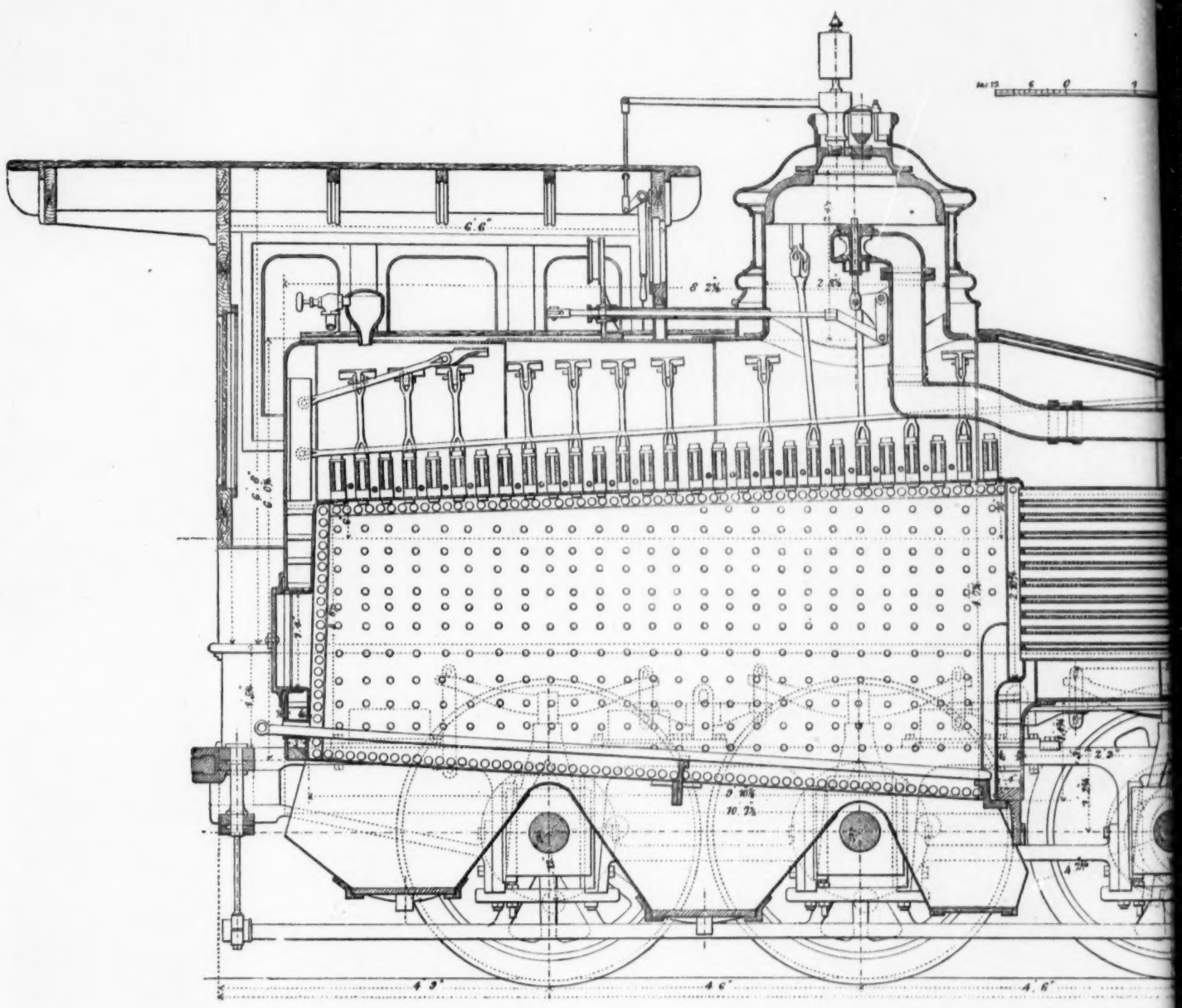
Nearly three years ago Mr. Albert Fink prepared a pamphlet in which this subject was investigated. It was intended to form a part of a larger work in which the cost of freight transportation would be treated also. At that time there was a demand in many directions for some exposition in detail, based on actual experience, of the cost of railroad transportation. State legislatures were passing laws which the railroad companies claimed to be grossly unjust, by limiting the price of transportation much below the cost, including interest on the investment. The Post-Office Department was requiring a species of services which were claimed to be enormously disproportionate to the price received for them. Yet when the member of a legislature or of Congress or other person asked the railroad man the question: "If this does not take into consideration the actual cost of transportation and the circumstances affecting it, what is that cost and what are those circumstances?" he received no definite and complete answer, fortified by proofs drawn from the records of railroad business. He was apt to conclude that the railroad men did not know what the cost of transportation was, or that they were afraid to tell the truth about it, lest they should thus establish the charge of extortion.

Truth was, indeed, that usually they did not know the details of the cost of transportation under different circumstances. They knew that the cost varied usually with the amount of traffic, the grades, the length of haul, the proportion of cars hauled back empty, the speed, etc. But the railroad officer was rarely able to do more than guess *how much* the cost was affected by these circumstances for any given amount of traffic. His analysis, so far as he made any, was qualitative, not quantitative. He did not much feel the need of an exact distribution of expenses, because in the actual circumstances of transportation business he usually needed all the profit he could get out of all business, and accepted any traffic that afforded the slightest profit at all times, and whether it yielded a profit or loss when engaged in a competitive contest with a rival. But the time had come when definite and detailed information as to the elements of the cost of transportation was required. Railroad companies were arguing with legislatures and before courts on questions which involved

* Investigation into the Cost of Passenger Traffic on American Railroads, with Special Reference to Cost of Mail Service and its Compensation. By Albert Fink, C. E.

FREIGHT LOCOMOTIVE ("CONSOLIDATION" TYPE) FOR

CONSTRUCTED BY THE



Cylinders:	Ft.	In.
Diameter,	1	8
Stroke of piston,	2	0
Length of steam ports,	1	4
Width "	0	1¼
" of exhaust ports,	0	2½
Travel of valve,	0	5⅝
Outside lap of valves,	0	0¾
Inside "	0	0 1/32
Exhaust nozzles—variable.		

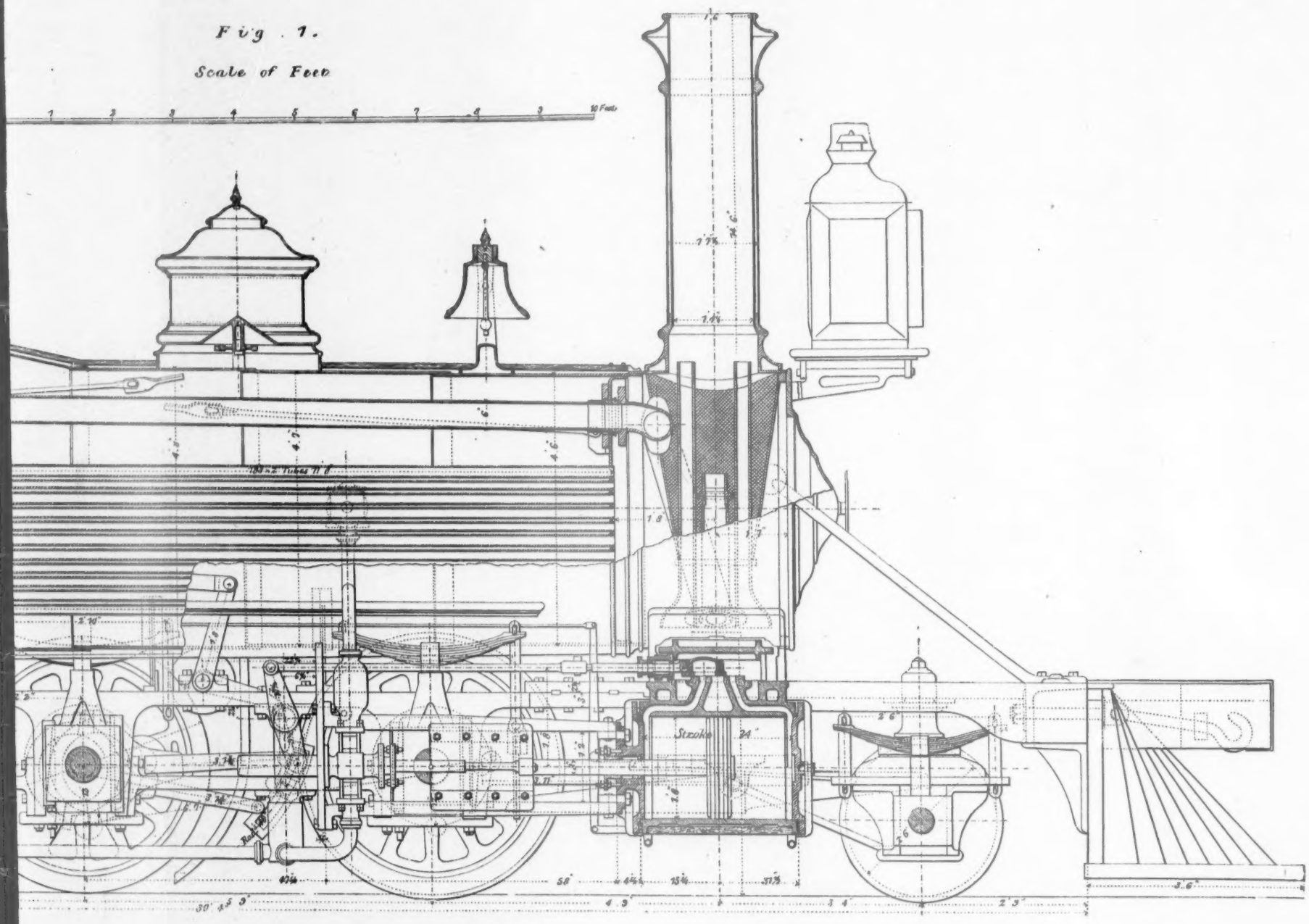
Wheels:	F
Diameter of driving wheels,	4
" truck "	2
Distance between centers of front and rear driving wheels,	14
Total wheel-base of locomotive,	22
" " " " and tender,	4
Diameter of driving-axle journals,	0
Length " "	0
Diameter of main crank-pin bearing,	0
Length " " "	0

FOR THE LEHIGH VALLEY RAILROAD, AT THE CENTENNIAL EXHIBITION.

BY THE BALDWIN LOCOMOTIVE WORKS, PHILADELPHIA.

Fig. 1.

Scale of Feet



	Ft.	In.
	4	2⅜
.	2	6
rear		
.	14	9
.	22	10
der,	46	2
.	0	7
.	0	8
.	0	5
.	0	5

BOILER:	Ft.	In.
Outside diameter of smallest ring of boiler,	4	6
Thickness of boiler plates (iron), . .	0	0½
Number of tubes, ... 198,		
Length "	11	0
Outside diameter of tubes, ...	0	2
Length of fire-box inside, ...	9	10
Width "	2	9¾
Depth " (sloping) . .	44½-55	
Thickness of fire-box plates (steel), sides and back, ...	0	0 5/16

BOILER:—*Continued.*	Ft.	In.
Thickness of tube plate, ...	0	0½
" crown sheet, ...	0	0⅜
	SQR. FT.	
Grate surface, ...	27.6	
Heating surface in fire-box, . . .	149	
" " in tubes, ...	1132	
Total heating surface, ...	1281	
WEIGHT:	Lb.	
Weight of engine in working order, . .	100,000	
" " on coupled wheels, .	88,000	

their future prosperity—almost their existence. They did not often find it difficult to show that what was proposed was unreasonable; but the legislator was inclined to pay no heed to that unless he was shown what was reasonable and why. "We should be paid more for hauling postal cars," said the railroad manager. "But you get more than for an average car-load," he was answered. "But the postal car is carried at express speed, is heavier than a freight car, is costlier, costs more to maintain," replied the railroad man, "and speed and weight cost money." "How much do they cost?" was the rejoinder; and the answer to this question had so many "abouts," "probablys," etc. in it that its force was greatly weakened. The fact was, comparatively few companies kept their accounts sufficiently in detail to enable them to say how much the cost of a given traffic was likely to be increased by a given circumstance.

When the contest concerning the price to be paid for postal car service was at its height, Mr. Fink printed his pamphlet. Printed, not published; for the work has not until now been published and made accessible to all. However, many railroad men received copies, and it was supplied to some legislators, State and national, and selections from it were published in the *Railroad Gazette*. It was recognized at once as the most thorough discussion of the cost of transportation, so far as it went, that had yet appeared. Nothing has been published since to dispute its position, and an examination of a considerable part of the foreign literature on the subject leads us to the conclusion that nowhere has there appeared so thorough an examination, based on recorded facts, of the elements of the cost of transportation by rail.

Here we find answered scores of the questions which the public had been so long asking of railroad officers and railroad officers had been asking of themselves. The tables at the end of the pamphlet are full of the information which inquirers had for years been trying to calculate from imperfect data. Here, for instance, was an answer to one of the questions so much discussed in connection with the mail service, the cost per mile per car. Mr. Fink gives it, and gives it with the detail required. There is the average cost in passenger trains and in freight trains, including working expenses only, and also including interest on the investment, on a main through line, and on four or five branch or subsidiary lines, with varying traffic, but under the same management; not for one year alone, which might be exceptional, but for each of seven years. When the Louisville & Nashville Company asked the Government for "reasonable" pay for hauling postal cars, and was asked what was "reasonable," its manager was able to say: "In 1873 it cost us 29.12 cents per mile to haul a car in a passenger train for working expenses, and including interest the cost was 40.15 cents. Less than the latter amount was not reasonable pay." If it was urged that freight was carried at much lower rates, he could point out the fact that this same year the average cost of per car mile in freight trains was only 12.57 cents—less than one-third of the cost on passenger trains.

If the farmer on the Richmond Branch complained that he was charged several times as much for freight as the rates on some other parts of the road, reference to one table would show him that the cost was 7.62 cents per ton per mile on his branch, but only 1.99 cents on the main line, interest included. Here, too, were given the dead weight of passenger and freight trains; the average gross weight of these trains; the average number of passengers and tons of freight carried per train and per car; the cost per ton per mile of the gross and the net weight of passenger trains, and other similar information which students of transportation had often found indispensable to safe conclusions, and yet which seemed unattainable. The fact that this information was given not for one line alone, but for several lines differing greatly in alignment and traffic, and not for a single year, but for a series of years (in some cases seven); and not for lines whose accounts were kept in different ways, and whose business was managed variously, but for the several lines of a single system under one manager, and so having their accounts made and divided similarly and their traffic managed with similar appliances and the same degree of intelligence—this fact heightened the value of the comparisons made.

Not the least of the services performed by this investigation was the proof of great difference in the cost of transportation under different circumstances and on different lines. It did not require much knowledge to decide *a priori* that such great differences must exist; but reasoning of this kind, however conclusive, was not very impressive on a suspicious community, which, however, would be compelled to accept the results of actual experience. Mr. Fink's investigation, instead of saying that the cost of transportation per ton and per passenger per mile *must be* greater because the traffic was light or the grades steep, etc., showed that the cost *had been* greater, and *how much* it had been greater, on such lines than on others under more favorable conditions. There was no escaping his conclusions without impeaching his facts, which were taken from the records of years of actual experience.

Thus already, with its restricted circulation, this work has had doubtless a decided effect on discussions of the cost of transportation. It is also the most convenient abstract of facts for those engaged in further investigations of railroad expenses. The expenses per train mile, for instance, are given under no less than sixty different heads, and many of these for freight and passenger trains separately, and all for three different lines. Thus the material is provided for estimating the probable saving of a given improvement affecting but one or two, or other part, of the expenses. For instance, the master car-builders the other day discussed the importance of reducing the dead weight of cars. A reference to a table in Mr. Fink's work would have enabled them to say which of 60 items of expenses per train mile would be affected by such reduction. This makes it comparatively easy to find (approximately) *how much* could be saved per train-mile by any given reduction of weight. The figures would not hold good for all roads, but the proportions would at least indicate the truth, and prevent some of the enormous blunders sometimes made concerning this and similar matters. There are 20 pages of tables in this pamphlet, all records of facts on the different lines of the Louisville & Nashville Railroad when worked by the author, and probably the most interesting masses of figures that ever met the eye of the American student of transportation, as almost every expression represents something which such a student has sought for by laborious computations, where any material for them could be found, while the number of elements forming the whole is greater and more uniformly made than can be had anywhere else, and yet they represent operations on several different kinds of roads.

In this issue of his pamphlet, Mr. Fink has added a preface, and also a feature of special interest just now, namely, a verbatim report of his examination before the Special Commission on Railway Mail Transportation, authorized at the last session of Congress. A large part of this was devoted to an exposition of the effect of speed on cost—a subject on which the wildest notions prevail among people who ought to know better. As we have had occasion to say before, men seem to think that a horse can plow on a trot as easily as he can draw a buggy at that gait, and when they make calculations for increasing the speed of a locomotive from 15 to 40 miles an hour, they do not always remember to reduce the load in the proper proportion. Mr. Fink has put the case in a way which we believe Congressmen even will be able to understand. We remember not long ago, in the course of the discussion on the proper pay for mail service, a certain official argued that it was cheaper to haul cars at express speed than at freight speed, because the engine, cars and train-men would get over more ground per day. That official should have been asked to run a mile carrying a hod of coal.

Mr. Fink shows very well that the cost of transportation on different roads varies too much to make a uniform rate for carrying the mails equitable. He favors arbitration to determine the rates when the Post-office Department and the companies cannot agree as to the terms, which is certainly a sensible method and practicable, as the experience of Great Britain for many years testifies.

We commend this little work to the attention and the careful study of railroad men and other students of transportation. They will find it not only useful, but very attractive and suggestive. It is written in an unusually clear style, and hardly any reader can fail to understand everything in it at sight. The tables represent facts in a past age (though not yet three years past) of railroading; but the figures are valuable as showing proportions where the amounts no longer hold good; and the tables as a whole serve as a form for dividing expenses, which makes it easier to compute the elements of cost for other roads which keep the requisite accounts. It is to be hoped that the work will stimulate other investigations, and especially lead to an imitation of the author in the careful collection of facts and the thorough analysis of the elements which enter into the cost and price of transportation.

An Epidemic of Negligence.

In connection with an examination of the circumstances attending the Ballardvale collision on the Boston & Maine Railroad, the Massachusetts Railroad Commissioners have issued a report, published elsewhere, in which they call attention to the fact that there have been recently many accidents due to pure negligence by the railroad employes. Properly they cite this negligence as evidence of a lack of proper discipline. It is common for railroad companies, when accidents occur through the act of an employe in disobeying positive orders, to assume that they are blameless: they gave proper orders, and if the employe neglected them, that is not their fault. He was an old employe and known as a faithful man. But this will not excuse the companies. It is not only their duty to issue proper orders, but to see that they are obeyed; not only must they take pains to employ steady and careful men, but they must adopt such a system as will cultivate in these employes the habit of strict obedience and make it difficult for them to be negligent. That is, largely, what discipline consists of. If the man has for years been compelled to do everything in a regular, formal way, things non-essential as well as things essential to the safety of the traffic, he will be much less likely to cause an accident by his negligence than if he had been permitted to do things in his own way or in any way so long as he effected the result aimed at. The habit of strict obedience is what the companies should aim at, and they never can secure that so long as they are satisfied with good work done in an irregular way. The latter makes a "slouchy" service: the best men make mistakes sometimes because they have not been accustomed to do everything in a regular, formal, exact manner. Only in the latter way can habits of exactness be formed, and without such habits the most conscientious employe will sometimes cause an accident by doing what he did not intend to do.

But to secure such discipline, something more than strict and minute instructions is necessary. Effort must be made to *know* that they are strictly and minutely obeyed. And this implies what is too much neglected on American railroads—frequent and severe inspections; such an observation of the employes as will enable their officers to know just how they do their work and whether they obey orders strictly. In this matter, as we have said before, the railroads may take a lesson from the army. No soldier is put on duty without frequent tests of his understanding of his duties, though those duties may be similar to what he has done hundreds of times before. The effort is to prevent the possibility of a misunderstanding or the beginning of a relaxation of discipline. Too often in railroad service the misunderstanding or relaxation is first made known by an accident caused thereby.

The Grain Movement for Thirty Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

Week ending—	By lake.	By rail.	Total.	Per ct. by rail.
April 29	1,634,541	2,072,946	3,707,487	56
May 8	2,445,191	2,292,633	4,737,824	48½
" 13	1,538,526	2,302,940	3,841,466	60
" 20	1,602,170	2,016,304	3,618,474	55¾
" 27	1,747,408	1,820,456	3,567,864	51
June 3	2,412,162	1,797,922	4,210,084	42¾
" 10	2,894,915	2,147,670	5,042,585	42½
" 17	2,921,405	2,391,811	5,313,216	45
" 24	2,728,706	2,198,054	4,926,760	44½
July 1	1,821,155	1,784,548	3,605,703	49¾
" 8	1,765,010	1,205,184	2,970,194	40¾
" 15	1,648,508	1,228,678	2,877,186	42¾
" 22	2,269,336	1,032,825	3,302,161	31¼
" 29	1,466,502	1,038,208	2,504,710	41½
Aug. 5	2,055,243	1,283,268	3,338,511	38½
" 12	1,744,059	1,300 720	3,044,779	42¾
" 19	2,150,292	1,614,256	3,764,548	42¾
" 26	2,352,152	1,520,811	3,872,963	39¼
Sept. 2	1,698,491	1,573,058	3,271,549	48¼
" 9	2,374,473	1,818,411	4,192,884	43¼
" 16	2,963,634	1,688,318	4,651,952	36¼
" 23	2,268,894	1,820,361	4,089,255	44½
" 30	2,427,357	1,797,847	4,225,204	42½
Oct. 7	3,009,394	1,650,858	4,660,252	35¾
" 14	2,530,729	1,835,991	4,366,720	42
" 21	2,673,647	1,800,837	4,474,484	40¼
" 28	2,635,237	1,359,160	3,994,397	34
Nov. 4	1,550,948	2,351,914	3,902,862	60¼
" 11	2,422,157	1,399,994	3,822,151	36¾
" 18	1,867,483	1,372,271	3,239,754	42¾
Total for 30 weeks	65,619,725	51,518,254	117,137,979	44

Shipments have been decreasing constantly for five weeks. They have not been so small as last week since early in August, and have been smaller but four times since navigation opened. The lake shipments remained large, a little above the average for the season, though the season was getting late for lake navigation.

For the same 30 weeks the receipts at the different Atlantic ports have been:

	Corn.	Per cent. of total.	All grains.	Per cent. of total.
New York	20,505,993	34.8	52,682,136	46.5
Boston	6,274,228	10.6	9,002,684	8.0
Portland	528,400	0.9	915,179	0.8
Montreal	3,444,381	5.9	11,276,449	10.0
Philadelphia	13,357,826	22.7	20,366,175	18.0
Baltimore	12,751,900	21.7	16,076,688	14.2
New Orleans	2,014,923	3.4	2,903,596	2.5
Total	58,877,650	100.0	113,222,895	100.0

Compared with the previous week, New York loses rank a trifle as a corn receiver, but gains considerably in receipts of all grains. In corn the changes are all trifling. New York's gain is equalled by Boston's, and the gain of the two balances a loss at Philadelphia, and is no greater than an unusual gain at New Orleans.

In all grains New York's gain is balanced by Montreal's loss, and a slight loss at Philadelphia by a corresponding gain at New Orleans.

Of the total corn receipts for the last week reported, 33 per cent. was at New York, 24⅓ at Baltimore, 16⅓ at Boston, 13 at Philadelphia and 10 per cent. at Montreal. These proportions for grains of all kinds were: New York, 56¾ per cent.; Philadelphia, 14¼; Baltimore, 12¾; Boston, 9; New Orleans, 4¼. Nearly seven-eighths of the wheat went to New York.

Railroad Earnings in October.

October earnings are reported in our table by 31 railroads—an unusually large number. These had 15,588 miles of road this year, which is more than 20 per cent. of the total mileage of the country. Nineteen of the 31 roads show an increase of earnings. But the decreases in amount nearly balance the increases, and per mile of road there is an actual decrease from $694 to $686, which, considering that October was the month of the greatest activity in Centennial traffic—the month of the heaviest passenger traffic ever known in America, doubtless—is not very encouraging. Of the roads which have a large share of through traffic between the East and the West, and therefore are most likely to have their earnings affected by the extremely low rates, the Canada Southern, the Michigan Central, the Ohio & Mississippi and the Philadelphia & Erie report. They show: the Canada Southern, an increase of 5 per cent.; the Michigan Central, a decrease of 3.7 per cent.; the Ohio & Mississippi, a decrease of 1.2 per cent.; the Philadelphia & Erie, an increase of 0.4 per cent.; the four together a decrease of $21,168, or 1.4 per cent. A very large share of the traffic of these roads being through, and carried at rates considerably lower than those of last year, it follows that there

must have been a considerable increase of traffic to make the gross receipts as great as they were, and it would be a reasonable inference that the legitimate expenses of the roads could not have been much reduced, had not such a prodigious capacity for cutting-off expenses been developed of late. Rates however, were very low at this time last year.

For the ten months ending with October our table has reports from 29 roads, with 15,012 miles of road—about one-fifth of the mileage worked. These roads, with an increase of 2.1 per cent. in mileage, have increased their gross receipts 6.9 per cent. Their average earnings per mile increased from $4,760 last year to $4,981 this, or at the rate of 4.6 per cent.—a substantial improvement.

The reports, as always, are but slightly significant of the course of railroad business, for the reason that they include so few of the great representative roads. With the Boston & Albany, the New York, New Haven & Hartford, the New York Central & Hudson River, the Erie, the Pennsylvania, the Baltimore & Ohio, the Pittsburgh, Cincinnati & St. Louis, the Pittsburgh, Fort Wayne & Chicago, the Lake Shore & Michigan Southern, the Chicago & Northwestern, the Chicago, Burlington & Quincy and the Chicago, Rock Island & Pacific added to the list in our report, some adequate idea might be formed of the condition of railroad business north of the Ohio. Of two roads whose chief business is carrying produce to Chicago, one shows a large increase for October and the other a still larger decrease; of five whose chief business is carrying produce to St. Louis, four show large increases and the other a large decrease. Six Southern railroads report—an unusually large number—and all but one show an increase, and in most cases this increase is large. All these comparisons are for October: for the ten months the results are in many cases far different and usually more favorable.

Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

Raleigh & Augusta Air Line.—Extended southwest 19 miles, to a point 86 miles from Raleigh, N. C.

Columbus & Toledo.—Extended from Bradner, O., north by west to Walbridge, 17 miles, completing the road.

Chicago & Lake Huron.—Extended from Shiawassee, Mich., west by south 10 miles.

Rock Island & Mercer County.—Extended south 7 miles to Richland Grove, Ill.

Milwaukee, Lake Shore & Western.—Extended from Appleton, Wis., west by north to Hortonville, 10 miles.

Burlington & Northwestern.—Extended northwest 13 miles to Winfield, Ia. It is of 3-ft. gauge.

Chicago, Rock Island & Pacific.—The *Oskaloosa Branch* is extended from Olive Branch, Ia., west to Knoxville, 14 miles.

Waterville & Washington.—The first track is laid from Waterville, Kan., west 10 miles.

Texas Western.—Extended west 10 miles to Buffalo Bayou bridge. It is of 3-ft. gauge.

East Line & Red River.—Extended northwest 5 miles to Hickory Hill, Tex.

International & Great Northern.—Extended from Duval, Tex., west to Austin Summit, 7 miles.

Galveston, Harrisburg & San Antonio.—Extended from Marion, Tex., west to Santa Clara, 10 miles.

This is a total of 132 miles of new railroad, making 2,102 miles completed in the United States in 1876, against 1,150 miles reported for the corresponding period in 1875, 1,664 in 1874, 3,276 in 1873, and 6,202 in 1872.

THE BASIS OF SETTLEMENT OF THE RAILROAD WAR suggested and favored at the recent trunk line conference is reported to be equal rates from the Northwest to Europe by way of all the ports, and a difference of 2¼ cents per hundred in favor of Baltimore and 2 cents in favor of Philadelphia, as against New York, on fourth-class freight not exported. This difference is in proportion to distance only when the rate is 20 cents from Chicago to New York, as it has been, nominally, for the past six months. The difference was not to increase with the rate, as was the rule last winter. The latter rule tends to send grain to Philadelphia and Baltimore when rates are high and profits good, and to give New York and New York railroads a better share of the business when rates are low and the profits slight or nil. A difficulty in the way of the new basis is the ascertainment of the fact of exportation of freight not billed through to the satisfaction of the different companies, and it is said that this is one of the matters remaining to be settled. However, there is no sufficient authority for saying that the report is correct: it has found credence because it seemed reasonable and a compromise such as the different companies could accept.

THE WINTER PORT OF CANADA is to be Halifax after all and not Portland, at least so far as the Government can decide the question. The Postmaster General of the Dominion has ordered the steamship lines carrying the Canadian mails to land them at Halifax hereafter when the St. Lawrence is closed to navigation. The steamers will run to Portland as heretofore, stopping at Halifax by the way, but the Halifax people hope, with the aid of the Intercolonial, to bring so much business to their port that the trip to Portland will soon be unnecessary. The mails and the steamer landings, which they consider the first step to this end, are secured, and Halifax rejoices accordingly.

General Railroad News.

ELECTIONS AND APPOINTMENTS.

Connecticut Western.—At the annual meeting in Hartford, Conn., Nov. 21, the old board was re-elected, as follows: Wm. H. Barnum, Lime Rock, Conn.; A. H. Holley, Lakeville, Conn.; Joseph Toy, Simsbury, Conn.; Byron Loomis, Suffield, Conn.; Frederick Watson, Canaan, Conn.; Wm. L. Gilbert, George Dudley, West Winsted, Conn.; George M. Bartholemew, T. M. Allyn, Wm. Bolles, George S. Frink, N. B. Stevens, Charles T. Hillyer, Hartford, Conn.

Duxbury & Cohasset.—At the annual meeting in Boston, Nov. 21, the old board was re-elected, as follows: S. N. Gifford, Duxbury, Mass.; Joseph O. Cole, Scituate, Mass.; Royal A. Turner, Randolph, Mass.; N. H. Whiting, Marshfield, Mass.; Wm. T. Davis, Plymouth, Mass.; George O. Brastow, Somerville, Mass.; Oliver Ames, Easton, Mass.; Uriel Crocker, Boston; Onslow Stearns, Concord, N. H. The road is controlled by the Old Colony Company.

Monadnock.—At the annual meeting in Peterboro, N. H., Nov. 22, Jonas Livingston was chosen President and Wm. G. Livingston Clerk and Treasurer. The road is leased to the Boston, Barre & Gardner.

Chicago & Lake Huron.—Mr. Charles. B. Peck has been appointed General Freight Agent. He was formerly General Superintendent and Freight Agent of the Leavenworth, Lawrence & Galveston (to which he went from the Milwaukee & St. Paul), and has been for some time past Assistant General Freight Agent of the Grand Trunk.

Chicago & Paducah.—Mr. T. H. Williamson has been appointed General Ticket Agent and Cashier in place of A. E. Tyler, resigned.

Chicago & Michigan Lake Shore.—The United States Circuit Court at Grand Rapids, Mich., has appointed Mr. George C. Kimball Receiver. He has been for some time General Manager of the road. He has continued all the officers of the road in their respective positions.

United States Rolling Stock Company.—Mr. H. R. Torrey, formerly foreman of the Aurora round-house of the Chicago, Burlington & Quincy Railroad, has been put in charge of the machine and blacksmith shops at this company's newly acquired Chicago car shops. Mr. E. White is in charge of the wood work at the same shops.

Buchanan & Clifton Forge.—At the annual meeting in Richmond, Va., Nov. 16, Charles S. Carrington was chosen President, with the following directors: W. W. Gordon, A. Y. Stokes, Thomas Seddon, Richmond, Va.; B. H. Newlin, Lynchburg, Va.; John J. Allen, Botetourt County, Va. The board elected Wm. P. Munford Secretary and Treasurer.

Kansas Pacific.—The Receivers have made the following appointments: General Manager, Robert E. Carr; General Superintendent, T. F. Oakes; Auditor, S. T. Smith; General Passenger Agent, E. A. Parker; Acting General Freight Agent, John Muir; Purchasing Agent, John L. Wood; Cashier, Wm. Caleff. Under the company Mr. Carr was President; Mr. Oakes, Vice-President and General Freight Agent; Mr. Muir, Assistant General Freight Agent, while the other officers are retained in their former positions. Mr. Parker will not fill the office held by him, as his death is announced in another column.

Pittsburgh, Wheeling & Kentucky.—The new board has elected C. D. Hubbard, President, and James Campbell, Secretary.

Shepaug.—At the annual meeting in Litchfield, Conn., recently, the old board was re-elected and it subsequently re-elected J. Deming Perkins, President; Henry R. Coit, Treasurer; Wm. Deming, Secretary.

Burlington & Northwestern.—Mr. J. R. Keun has been appointed General Ticket Agent, with office in Burlington, Ia. Mr. Keun will also act as Station Agent at Burlington.

Kansas Pacific.—The board has elected T. G. Meier and D. M. Edgerton directors, in place of A. Meier and C. S. Greeley, resigned. It has also elected D. M. Edgerton, Vice-President in place of T. F. Oakes, resigned.

Brockville & Ottawa.—Mr. H. Abbott has been appointed General Superintendent, in which office are united those of Managing Director and Mechanical Superintendent, both now abolished.

Corpus Christi, San Diego & Rio Grande.—At the annual meeting in Corpus Christi, Tex., Nov. 13, the following directors were chosen: W. L. Rogers, U. Lott, J. B. Mitchell, A. M. Davis, P. Hoffman, P. Doddridge, D. Hirsch, George French, John S. McCampbell, Ed. Buckley, T. H. Clark, N. G. Collins, M. Kenedy.

Wabash.—The first board of directors of the Wabash Railway Company, organized by the purchasers of the Toledo, Wabash & Western, is as follows: Elisha A. Coray, Henry Crawford, John W. Ellis, Cyrus W. Field, Solon Humphreys, William B. Isham, Morris K. Jesup, John S. Kennedy, E. H. R. Lyman, John T. Martin, Henry A. V. Post, James A. Roosevelt, George I. Seney. Mr. James A. Roosevelt is President.

Naugatuck.—At the annual meeting in Bridgeport, Conn. Nov. 15, the old board of directors was re-elected, as follows: W. D. Bishop, E. F. Bishop, R. Tomlinson, Bridgeport, Conn.; H. Bronson, J. E. Robertson, New Haven, Conn.; J. G. Wetmore, Winsted, Conn.; R. M. Bassett, Derby, Conn.; F. J. Kingsbury, Waterbury, Conn.; A. L. Dennis, Newark, N. J. The board re-elected E. F. Bishop President; Secretary and Treasurer, Horace Nichols; Superintendent, George W. Beach; Auditor, Samuel Wilmot.

North Louisiana.—This company was permanently organized at a meeting held in Shreveport, La., Nov. 18, by the election of the following directors: Joseph Boisseau, W. H. Elstner, A. H. Leonard, Frank Morey, Geo. L. Smith, P. J. Trezevant, J. R. West. The board elected Geo. L. Smith, President; Joseph Boisseau, Vice-President; W. P. Ford, Secretary; F. A. Leonard, Treasurer; A. H. Leonard, Attorney. The office is in Shreveport, La.

Cincinnati, Lafayette & Chicago.—Mr. G. G. Hadley, late Master of Transportation, is appointed Assistant Superintendent, to date from Dec. 1.

Vermont Railroad Commissioner.—The Vermont Legislature, in joint convention, has elected Mr. Myron W. Bailey, of St. Albans, Railroad Commissioner for the ensuing two years.

Republican Valley.—The first board of directors is as follows: E. J. Jenkins, R. E. Allen, F. Rocque, F. W. Sturges, F. McKinnor, W. E. Reid, H. Buckingham, W. Connor, Concordia, Kan.; W. S. Crump, J. W. Jones, Clyde, Kan.; Cyrille Lafond, Shirley, Kan.; Rufus Berry, Clifton, Kan.; M. D. Smouse, Crack Creek, Kan. The office is at Concordia, Cloud County, Kansas.

Erie.—At the annual meeting in New York, Nov. 28, the following directors were chosen: Herman R. Baltzer, R. Suydam Grant, Hugh J. Jewett, John Taylor Johnston, E. D. Morgan, Marshall O. Roberts, Samuel Sloan, H. G. Stebbins, G. F. Talman, New York; S. S. Guthrie, Buffalo; G. W. Hotchkiss, Binghamton, N. Y.; Homer Ramsdell, Newburgh, N. Y.; Cortland Parker, Newark, N. J.; Thomas Dickson, Scranton, Pa.; Asa Packer, Mauch Chunk, Pa.; J. Lowber Welsh, Philadelphia; John B. Brown, Portland, Me. The new directors are G. F. Talman and M. O. Roberts, the latter a former director, who replace L. H. Meyer and Lucius Robinson. There was no opposition, and 380,000 shares were voted on by two persons—160,000 by Mr. Jewett and 220,000 by S. L. M. Barlow.

Old Colony.—At the annual meeting in Boston, Nov. 28, the old board was re-elected, as follows: Onslow Stearns, Uriel Crocker, Francis B. Hayes, Boston; Oliver Ames, Easton, Mass.; Chas. F. Choate, Cambridge, Mass.; Samuel L. Crocker, Taunton, Mass.; Jacob H. Loud, Plymouth, Mass.; Thomas J. Borden, John S. Brayton, Fall River, Mass.; Royal W. Turner, Randolph, Mass.; Ephraim N. Winslow, Hyannis, Mass.; Prince S. Crowell, Dennis, Mass.; Benj. Finch, Newport, R. I.

PERSONAL.

—Mr. O. S. Lyford retires from the position of General Superintendent of the Kansas Pacific Railway, which he has held about two years, succeeding Mr. Edmund S. Bowen, now on the Erie. Mr. Lyford is, we believe, an old Erie man himself, but went to the Kansas Pacific from the Hannibal & St. Joseph.

— Among the gentlemen elected to the next Congress who are connected with railroads are Messrs. Julian Hartridge, of Georgia, a director of the Atlantic & Gulf; Miles Ross, of New Jersey, Attorney for the Pennsylvania Railroad; Abram S. Hewitt, of New York, Receiver of the New York & Oswego Midland; John H. Starin, of New York, the projector and principal owner of the barge lines by which freight cars are brought to New York City across the Hudson River; Jacob D. Cox, of Ohio, Receiver and late President of the Toledo, Wabash & Western; and Thaddeus C. Pound, of Wisconsin, President of the Chippewa Falls & Western. Doubtless there are many others who are interested in railroads as holders of securities, or perhaps a few are directors of companies. Among the defeated candidates the most notable is Mr. Chester W. Chapin, President of the Boston & Albany, who is a member of the present House from Massachusetts.

– Mr. D. M. Kelly, General Manager of the Green Bay & Minnesota, has been elected to the Wisconsin Legislature.

—It is reported that the position of General Superintendent of the Atchison, Topeka & Santa Fe has been offered to Mr. B. S. Henning, now General Superintendent of the Leavenworth, Lawrence & Galveston and the Missouri River, Fort Scott & Gulf.

—Mr. C. W. Mosely, Superintendent of the Troy & Boston Railroad, died in Troy, N. Y., Nov. 24, after a short illness.

—The very large and valuable collection of paintings belonging to Mr. John Taylor Johnston, late President of the Central Railroad Company of New Jersey, is to be sold in New York shortly. The collection is one of the finest private galleries in the United States and its sale will be one of great interest to collectors. Mr. Johnston has been considered a very wealthy man, but is said to have lost very heavily by the decline in Central securities, of which he was and is still one of the largest holders, and he is also said to have spent a great deal of money in trying to keep up the stock.

—Mr. E. A. Parker, General Passenger and Ticket Agent of the Kansas Pacific, died at Wallace, Kan., Nov. 21, while on his way to Denver. His disease was dropsy of the heart. Mr. Parker began life as a train boy on the Chicago, Burlington & Quincy and remained with that company a number of years, rising to the position of General Western Passenger Agent. He left it to become General Passenger Agent for the Hannibal & St. Joseph, which road he left in 1874 to become Chicago Agent for the Chicago & Northwestern. He was appointed to his last position in July last, on the retirement of Mr. Beverly R. Keim. His health has not been good for several months past. He was a peculiarly hearty, frank, active young man, who made friends at first sight, and had the good will of everybody.

TRAFFIC AND EARNINGS.

Railroad Earnings.

The following are reports made to the Massachusetts Railroad Commission for the year ending Sept. 30, 1876:

	Earnings.	Expenses.	Net earn.	Earn. pr mile.	P.c. of exps.
Boston, Barre & Gardner	$158,476	$120,513	$37,963	$2,990	76.03
Fitchburg	1,859,455	1,329,838	529,617	9,832	71.52
Worcester & Nashua	545,966	344,728	201,238	11,952	63.24

Other earnings are reported as follows:

Year ending Sept. 30:	1875-76.	1874-75.	Inc. or Dec.	P. c.
Annapolis & Elkridge	$45,651	.....	.....	....
Expenses	35,214	.....	.....	....
Net earnings	$10,437	....	.....	....
Earnings per mile.	2,227	.....	.....	....
Per cent. of exps.	77.14	.....	.....	....
Western North Carolina	$94,759	.....	.....	....
Expenses	61,419	.....	.....	....
Net earnings	$33,340	.....	.....	....
Earnings per mile.	831	.....	.....	....
Per cent. of exps.	64.82	.....	.....	....

Ten months ending Oct. 31:	1876.	1875.			
Louisville, Cincinnati & Lexington	$943,927	$939,207	Inc.	$4,720	0.5
Expenses	667,183	.....	.....	.....	....
Net earnings	$276,744	.....	.....	.....	....
Per cent. of exps.	70.68	.....	.....	.....	....
Midland, of Canada.	$232,711	$249,311	Dec.	$16,600	6.7
Second week in November:					
Denver & Rio Gra'de, Main Line	$7,410	$7,875	Dec.	$465	5.9
Denver & Rio Gra'de, Trinidad Ex	3,266	.....	.....	.....	....
St. Louis, Iron Mt. & Southern	120,000	110,063	Inc.	9,937	9 0
Third week in November:					
Atchison, Topeka & Santa Fe	$56,817	$49,382	Inc.	$7,435	15.1
Chi., Milwaukee & St. Paul	178,000	211,585	Dec.	33,585	15.9
Michigan Central	120,711	121,810	Dec.	1,099	0.9
St. Louis, Kan. City & Northern	76,639	60,411	Inc.	16,228	27.0

Coal Movement.

Coal tonnages for the week ending Nov. 18 were as follows:

	1876.	1875.	Inc. or Dec.	P.c.
Anthracite	574,722	546,968	Inc.	27,754	5.1
Semi-bituminous	82,897	80,774	Inc.	2,123	2.6
Bituminous, Pennsylvania	44,760	42,711	Inc.	2,049	4.8

There is said to be a movement among the operators in the Wyoming anthracite region to reduce miners' wages, and some action to the same end is also talked of in the Lehigh Region. The recent auction sales of anthracite in New York indicated a falling market and a light demand.

The coal tonnage of the Pennsylvania Railroad for the ten months ending with October was as follows:

	Tons.
Anthracite	635,049
Semi-bituminous, Broad Top	131,029
" " Clearfield and Snow Shoe	1,005,799
" " Cumberland	110,439
Bituminous, Gallitzin and Mountain Region	171,962
" Westmoreland Region	705,420
" Pittsburgh Region	255,319
" West Penn. Div. and Southwest Penn. Branch	216,383
Total coal	3,231,400
Coke	650,620
Total coal and coke	3,882,020

East-bound Rates.

The rates on dressed beef and hogs reported last week are confirmed—85 cents per 100 lbs. for beef and 65 for hogs from Chicago to Buffalo. The Philadelphia rate is 10 per cent. and

the Baltimore rate 12½ per cent. less, which is in accordance with last winter's basis and in proportion to distance, the contest of the companies being for fourth-class freight and grain. These rates are about what is usually charged at this season. Dressed poultry and game came under the dressed beef rate. These form a traffic of some importance, but the dressed pork traffic is really large after winter sets in.

Grain Movement.

Receipts and shipments for the week ending Nov. 18 are reported as follows, in bushels:

	1876.	1875.	Decrease.	P. c.
Lake ports' receipts	2,916,023	3,213,054	297,031	9.3
" " shipments	3,239,754	3,419,162	179,408	5.2
Atlantic ports' receipts	3,668,890	4,057,502	388,612	9.6

Of the shipments from lake ports, 42⅝ per cent. were by rail this year, against 33⅓ per cent. in 1875 and 11¼ per cent. in 1874.

Chicago grain receipts and shipments for the week ending Nov. 25 were:

	1876.	1875.	Increase.	P. c.
Receipts	1,193,154	1,020,821	172,333	16.9
Shipments	1,145,573	845,681	299,892	35.4

Railroad Traffic.

For the ten months ending Oct. 31 the number of through passengers arriving in and leaving California was as follows:

	1876.		1875.	
	Arrived.	Departed.	Arrived.	Departed.
By sea	23,462	10,021	30,575	10,001
By rail	49,585	33,181	63,039	25,834
Totals	73,047	43,202	93,614	35,835

Decrease in arrivals, 22 per cent.; increase in departures, 20.5 per cent. The decrease in arrivals by sea was principally in Chinese immigrants. The San Francisco papers think that the greater number of departures is chiefly due to the numbers of people who have gone to make visits to their old homes in the Atlantic States and to see the Centennial.

Lake, Canal and Ocean Freights.

Vessels are making their last trips, and yet rates are at the ordinary summer standard. From Chicago to Buffalo 3½ cents for wheat and 3¼ for corn per bushel by sail and about half a cent higher by steam have been reported during the past week. There have been few or no through shipments by canal, the boats leaving Buffalo being usually destined for interior ports. Rates to New York were nominally 6¼ cents for wheat and 6 for corn, the closing of navigation having no effect in view of the low rail rates. Ocean freights are higher. Quotations for Tuesday on grain from New York were 9d. per bushel both by sail and by steam to Liverpool; 18 *cents* by sail to Bordeaux; 8⅝d. to Bristol; 9⅝d. to Cork for orders. Flour per barrel by sail to Glasgow, 3s. 3d.

THE SCRAP HEAP.

Railroad Manufactures.

The Pennsylvania Steel Company, at Baldwin, Pa., has put improved hydraulic apparatus into its blooming mill, effecting, it is said, a great saving in labor.

The Bessemer steel works of the Cambria Iron Company, at Johnstown, Pa., in the week ending Nov. 18, made 1,706 tons of ingots. The largest 24 hours' work was on the 17th, when 68 heats were made.

The Roane Iron Company, at Chattanooga, has bought a switching engine from the Baldwin Locomotive Works.

The Vulcan Iron Works, at St. Louis, are turning out 200 tons of steel rails and 150 tons of iron per day. They have a heavy order for plate iron for riveted pipes for the San Francisco Water Works.

The steel works of the Albany & Rensselaer Iron & Steel Company are closed at present. The Rensselaer Mill at Troy is running on merchant bar.

The Bethlehem Iron Company's steel works, at Bethlehem, Pa., are full of work. The iron rail mill and the bar mill are moderately busy.

The Putnam Machine Company, of Fitchburg, Mass., has recently received orders for several lathes, planers and slotting machines for the Central Pacific shops.

The Cambria Iron Company, of Johnstown, Pa., recently shipped a lot of steel rails to the Indianapolis, Cincinnati & Lafayette road.

The Vulcanized Fibre Company, of No. 17 Dey street, New York, is now running its works at Wilmington, Del., full time, with a full force. Their elastic fish-bolt washers are now in use on 75 different railroads, one, the New Orleans, St. Louis & Chicago, having 285,000 of them in its track.

The patent desks manufactured by the Wooton Desk Company, of Indianapolis, are in use by many railroad officers. They are being introduced abroad as well as in the United States, desks having been shipped by order to Secretaries of the Czar of Russia and the Emperor of Germany; also to Australia, Guatemala, Chili and Brazil.

The Richmond Iron Company's furnace at Van Deusenville, Mass., is to go out of blast as soon as the stock of charcoal is exhausted, which will be early in December. All three of the company's furnaces will then be idle and will probably not be blown in again until the stock of iron on hand, some 10,000 tons, is disposed of.

The Delaware Bridge Company, of which Mr. Charles Macdonald is President, has just completed the new bridge over the Hudson River from Starbuck's Island to Green Island, at Troy, N. Y., for the Rensselaer & Saratoga Railroad. The bridge is an iron lattice bridge, 600 ft. long and 65 ft. wide, and carries two railroad tracks, a street roadway with two horse-railroad tracks and a sidewalk for foot passengers. It replaces an old wooden bridge and was erected without stopping travel over the old bridge.

The Messrs. Fairbanks have just received an order from an elevator company in Missouri for eight 30-ton railroad track scales, and several 500-bushel hopper scales. The New York Central & Hudson River Company have just put in twenty-two 600-bushel hopper scales, of the Fairbanks' manufacture, at their new elevator in Sixty-fifth street, New York.

The Baltimore Bridge company has been awarded the contract for five spans of iron bridge for the northern approaches to the Cincinnati Southern bridge over the Ohio River. The cost will be about $46,500.

The Starr Manufacturing Company, of Halifax, N. S., has a contract for a large iron bridge for the Intercolonial Railway.

Living Within His Salary.

There were several good stories told at the conductors' banquet Thursday evening, but the one that created the most laughter was that which was related by Conductor McElroy, from Pennsylvania. He said that a conductor on an Eastern railroad was approached by a seedy-looking individual, who wanted to get a free ride, as he didn't have any money.

"All right," said the conductor, "go forward into the smoking-car, and I'll fix you all right."

Soon afterwards the conductor appeared in the smoking-car to collect fare from the passengers. He took up fare from everybody except the dead-beat and another man, who happened to be the Superintendent of the road. The Superintendent noticed that he had overlooked this man, and asked him why he had done it.

"Why, that's a conductor," was the reply.

"His appearance does not indicate it. Look at those clothes," said the Superintendent.

"Well," said the conductor, "he can't help that. He's a conductor on a Western road, and he's one of those fellows who are trying to live within their salary, and that's what he has come to."

This was satisfactory to the Superintendent, and the man obtained his ride without further inquiry. Mr. McElroy stated that there was nothing personal in the story.—*Omaha Bee.*

OLD AND NEW ROADS.

New York Elevated.

On Wednesday of this week this company nearly doubled its train service, and by the present time table trains are dispatched at intervals of eight minutes through the day. This is made possible by the completion of two sections of second track, one extending past the Eleventh street, the Fourteenth street and the Twenty-first street stations; the other passing the Forty-second and Fiftieth street stations. There is also a new siding at Liberty street. The rolling stock is increased by the addition of two locomotives from the Brooks Locomotive Works (making 16 in all) and eight cars from Gilbert, Bush & Co., of Troy, N. Y. There are now about 100 trains each way daily. Additional trains were much needed, as traffic has so increased that many had to stand morning and evening.

Huntington & Broad Top.

The contract for the construction of the Sandy Run Branch of this road has been awarded to Mr. Charles Robb Wilson, of Philadelphia, who has already commenced work with a large force of men on the first two miles. This section is to be completed by Feb. 1, 1877. The semi-bituminous coal developments on Sandy Run are of such a nature as to warrant the building of this branch.

New York, Housatonic & Northern.

In the foreclosure suit against this company, on an intervening petition of Lewis D. Rucker, formerly President of the company, the New York Supreme Court has ordered claims of Mr. Rucker for $108,000 money advanced and for $27,000 on a judgment against the company to be entered as liens on the property.

Winter Time Tables from New York.

All the through lines and most of the local lines from New York changed this week, the through lines on Nov. 27. On the Pennsylvania the through Western trains now leave at 8.30 a. m., 6 and 8.30 p. m., the last train also connecting for Erie. The morning train leaves an hour earlier than before. To Washington there are now five trains, the limited express at 9.30 a. m., and regular express trains at 8.40 a. m., 1, 6 and 9 p. m. An additional train has been put on, the afternoon train which left New York at 3 p. m., being replaced by two, at 1 and 6 p. m. All the special Centennial trains are dropped. In local trains there is little change.

On the Erie there is no change in time of departure, express trains leaving at 9 a. m. and 7 p. m., as heretofore, and through mail at 10.45 a. m. There has been a considerable reduction in local train service.

On the New York Central & Hudson River the Chicago trains leave at 8 and 10:30 a. m., 3 and 8 p. m. Northern express trains with local connections over the Central west from Albany at 11 a. m., 5 and 11 p. m. One Chicago express is dropped and the two afternoon trains leave half an hour earlier than in the summer.

The Central of New Jersey does little through business except with its immediate connections in Eastern Pennsylvania. The local winter time table shows a slight reduction in train service, which is said to be the forerunner of a much greater future reduction. This is very probable, as the local service has heretofore had an excessive and unprofitable number of trains.

The Delaware, Lackawanna & Western puts its afternoon Binghamton & Utica express half an hour earlier, at 4:30 p. m., but makes no other change in through trains and very little in local, the suburban business of this road being very steady and showing but little change through the year.

Louisville, Cincinnati & Lexington.

The Auditor's report for October is as follows:

	1876.	1875.	1874.
Passenger earnings	$45,208 38	$50,548 22	$48,876 96
Freight	60,807 28	56,929 56	48,243 45
Express, mail, etc	7,415 30	7,101 03	5,987 05
Total	$113,430 96	$114,578 81	$103,107 46
Working expenses	65,262 84	66,448 57	80,707 28
Renewal of ties and rails	10,167 89	9,009 30	16,402 57
Total	$75,430 73	$75,457 87	$97,109 85
Net earnings	$38,000 23	$39,120 94	$5,997 61
Construction, taxes and rentals	593 45	6,216 55	8,188 02
Net profit	$37,406 78	$32,904 39	Loss. $2,190 41

The earnings this year were $498 gross and $167 net per mile; expenses and renewals were 66.51 per cent. of earnings.

Columbus, Chicago & Indiana Central.

In Indianapolis, Nov. 24, at suit of J. F. D. Lanier, trustee, the United States Circuit Court granted a decree of foreclosure and sale against the line from Richmond, Ind., to Logansport, the old Cincinnati, Logansport & Chicago road. This is part of the southern of the company's two lines from Columbus to Logansport, and its sale or separation from the rest of the road would not interfere with the operation of the line to Chicago, or of that to Indianapolis.

Old Colony.

At the annual meeting in Boston, Nov. 28, the stockholders voted unanimously to authorize the issue of $2,000,000 new 6 per cent. bonds, the proceeds to be used in paying bonds maturing in 1877; also to approve the purchase of the Fall River, Warren & Providence road and to accept the acts of the Massachusetts and Rhode Island Legislatures authorizing that purchase.

Hudson Tunnel Railroad.

All the legal obstacles and injunctions having been removed, the commissioners to condemn the land needed by this company in Jersey City have been appointed by the Court, and were to meet Dec. 1 to begin proceedings.

St. Louis, Iron Mountain & Southern.

The freight brakemen on the Arkansas Division struck Nov. 24 on account of an order requiring them to remain on top of their cars during the entire run of the trains. No freight trains went through on that day, but passenger travel was not interrupted. Later advices state that matters were adjusted and traffic resumed, without giving particulars.

Chicago & Michigan Lake Shore.

The United States Circuit Court at Grand Rapids, Mich., has appointed Mr. George C. Kimball, General Manager of the road, Receiver. Interest has been in default since 1873 on all the bonds, we believe, except $477,000 first-mortgage bonds. The road extends from New Buffalo, Mich., to Pentwater, 170 miles, with branches to Grand Rapids, 25.5 miles, and to Big Rapids, 51.5 miles. The bonded debt amounted by the latest report to $6,630,000.

Lynchburg & Richmond.

This line, which is more commonly known as the Straight-Shoot Line, has been the subject of much talk in Virginia for some years past. A correspondent writes of it as follows: "The Straight-Shoot Railroad Company is organized under a charter granted by the State of Virginia. Its line runs from Richmond, Va., by way of Lynchburg to Clifton Forge, a point on the Chesapeake & Ohio Railroad, and is about 200 miles in length. The entire line is under contract to be finished within three years. The contractors are to receive about four-fifths of their pay in the stock and bonds of the company.

"The principal object of this new road is to open a new market for the bituminous coals of West Virginia, and to open up the largest and richest iron belt east of Lake Superior and Missouri."

Ohio & Mississippi.

Messrs. Torrance and King have been appointed Receivers by the United States Circuit Court for Ohio, as well as in Indiana and Illinois.

The Circuit Court for Missouri has appointed Gen. Lewis B. Parsons Receiver *pro tem.* of the company's property in St. Louis. He will act until Messrs. Torrance and King can qualify in that district also.

In the Chancery Court at Louisville, Ky., Nov. 20, the Louisville Bridge Company entered suit against this company to recover $41,089.33 debt running up to Oct. 1, 1876, due from tolls and charges for the use of the Ohio River bridge, over which the company runs its trains to Louisville. The bridge company seeks to have the Court set aside, as null and void, a deed of trust or mortgage of the depot property in Louisville, made over to Wm. S. McClintick, of Chillicothe, O., and Chas. A. Beecher, of St. Louis, Mo., as trustees, on the ground that the conveyance was made with intent to delay and defraud the creditors of the road. It asks the Court to attach the property and sell it to pay the debt sued for.

On application of Robert Garrett & Sons, of Baltimore, and others, the parties in the other suits, the Kentucky Court of Chancery has appointed Messrs. Torrance and King Receivers of all property of the company in Kentucky.

Republican Valley.

A company by this name has been organized in Kansas to build a line from Greenleaf, on the Waterville & Washington road, now under construction, through Washington, Clay and Cloud counties to Concordia, about 50 miles. The capital stock is to be $900,000.

Oley Valley.

It is proposed to build a branch road from the Philadelphia & Reading at Monocacy Station northward through Friedenberg to Oley Furnace, about 11 miles. It is said that the line can be very cheaply built, and can secure a fair traffic.

Pennsylvania Transportation Company.

The pipe lines owned by this company from Geible Farm to Millerstown, Pa., Millerstown to Petrolia and Central Point to the Armstrong County line are advertised for sale in an action for debt by the Sheriff of Butler County, Pa.

New York & Oswego Midland.

In the United States Circuit Court in New York, Nov. 22, counsel for a number of bondholders applied to the Court for leave to appeal to the Supreme Court from so much of the decree of forclosure as directs the payment of the Receivers' certificates and preferred coupons from the proceeds of the sale.

Subsequently the Court decided to allow the motion for an appeal. This will postpone for some time the final settlement of the case. It will also decide a question of great importance, how far Receivers' debts and certificates may be made a lien upon a property in charge of a court.

Parker & Karns City.

The extension to Butler is now fully completed and in operation, and is already doing a good business. Four passenger trains each way are run through between Parker, Pa., and Butler, 27 miles, and three between Parker and Millerstown, 14 miles. The road is also carrying a good deal of freight.

Burlington & Northwestern.

The track of this road is now laid to Winfield, Ia., 35⅛ miles northwest from Burlington. Of this 18 miles is new track, from Mediapolis to Winfield, and for the remaining 15⅛ miles, from Mediapolis to Burlington, the track of the Burlington, Cedar Rapids & Northern road is used, a third rail being laid, as the new road is of 3 ft. gauge. The road is being ballasted, and regular trains will be put on about Dec. 1. The terminus of the road will be at Winfield until next spring, when the company purposes to extend the road further.

Meetings.

Meetings will be held by the following companies at the times and places given:

Boston & Maine, annual, at the City Hall in Lawrence, Mass., Dec. 13, at 10 a. m.

New York, Providence & Boston, annual, at the Company's office in Providence, R. I., Dec. 13, at 10 a. m.

Providence & Stonington Steamship, annual, at the office in Providence, R. I., Dec. 13.

Cincinnati Southern.

The bridge over the Cumberland River, one of the most important works on the line of the road, is completed. Including an iron trestle work at one end it is 1,257 feet long, is 156 feet high from the bed of the river and 74 feet above high-water mark. One end of the bridge is close to the entrance to a long tunnel. The masonry was built by Reid, Flannery & Co., the superstructure and iron trestle by the American Bridge Company, of Chicago.

Pennsylvania.

The Altoona *Sun* says: "The passenger transactions of the Pennsylvania Railroad Company at the Centennial depot, during the continuance of the International Exhibition, are given in the following table:

	Total No. Trains.	Total No. Cars.	Total No. Passengers.
May 10 to 31	1,924	9,422	102,245
June	2,861	14,064	187,481
July	3,039	16,875	169,791
August	3,021	24,346	320,960
September	4,373	30,588	644,903
October	5,329	37,552	861,688
November 1 to 10	1,245	8,447	325,165
	22,572	141,264	2,612,233

"It will be observed that while the list embraces the arrival of trains from all the roads that centralized at the Centennial depot, it gives no statistics relating to the vast quantity of Centennial travel that was conducted at the regular West Philadelphia depot, which was probably more than one-half of the entire amount of Centennial passenger service performed by the Pennsylvania Railroad Company."

Credit Valley.

This company has petitioned the City Council of Toronto, Ont., to purchase $150,000 of its bonds, and in addition to grant it a bonus of $100,000 to enable it to resume work on the road, which is now suspended.

A suit brought to relieve the town of Milton from the payment of a bonus of $30,000 heretofore voted has been decided in favor of the company, the Court holding that the conditions had been sufficiently complied with.

Cairo & St. Louis.

The strike of the enginemen and firemen does not appear to have been successful. The company has engaged a number of new men and most of the trains are running. It is said, however, that a general strike of the employes for their back pay is threatened. Several of the striking enginemen have been

arrested, and are now on trial on charge of damaging property of the company and assaulting men in its employ.

Missouri Pacific.

In St. Louis, Nov. 20, the County Court appointed Frank J. Bowman, Attorney for the county to receive the money due on account of the interest on the $700,000 county bonds issued in aid of the road. He is further instructed, in case of a refusal to pay, to institute such legal proceedings as may be necessary to recover.

Maysville & Lexington.

Some time ago the Maysville & Lexington Railroad, Northern Division, from Paris, Ky., to Maysville, was sold under foreclosure and bought in by the bondholders. It is now stated that the Maysville & Lexington Company, Southern Division, which owns the 19 miles of road from Paris to Lexington, has nearly completed arrangements for the purchase of the Northern Division. The terms of sale are, it is said, the assumption of the debt of the Northern Division, the payment of the cost of the new Licking River bridge and $50,000 in cash. The Southern Division Company is controlled by the Kentucky Central, which holds nearly all its stock.

Delaware, Lackawanna & Western.

A minor trouble has arisen as to the western approach to the new Bergen Tunnel. The grade of the Delaware, Lackawanna & Western has been fixed about three feet above that of the New Jersey Midland, which it crosses just west of the tunnel. The Midland declines to change its grade, however, and has applied to the Court of Chancery for an injunction against the other company, to prevent it from making the change.

The bridge over Tunkhannock Creek, near Nicholson, Pa., 380 feet long, was destroyed by fire on the night of Nov. 24. The rebuilding of the bridge was expected to take about 10 days, during which time a transfer of passengers was necessary. The fire is believed by some to have been started by some of the strikers from the Scranton shops.

Erie.

It is said that suit will be brought shortly against the Lake Shore & Michigan Southern to compel it to put the Erie on an equal footing with its other Eastern connections. The suit is to be based on the general law for preventing discrimination and also on an old contract with the Buffalo & State Line Company, afterwards consolidated with the Lake Shore, by which that company agreed to make no contract with the New York Central on terms more favorable than those given to the Erie.

Southwestern Railroad Meeting.

A meeting of the general passenger agents of Southwestern railroads was held in Memphis, Tenn., for the purpose of revising rates for the winter business, especially the Texas business. Mr. John W. Moss, of the St. Louis & Southeastern, presided, and Mr. Charles R. Kelley, of the Louisville, Cincinnati & Lexington, acted as Secretary. The proceedings were private, but the results reached will be published shortly.

Atlanta & Richmond Air Line.

It has been reported that Mr. John M. Robinson, President of the Seaboard & Roanoke, the Raleigh & Gaston and the Richmond, Fredericksburg & Potomac companies, has made arrangements to buy this road at the foreclosure sale next week, and that the bondholders' representatives do not object. The Raleigh & Gaston has nearly completed its Raleigh & Augusta line to a point which will give it a Charlotte connection, and if the purchase is made it will doubtless result in a transfer of the Air Line's through business from the Richmond & Danville to Mr. Robinson's roads. The proposed purchase is only a report, however. The sale is to take place Dec. 5.

Measuring the Pacific Railroads.

The officers of the Engineer Corps detailed to make a measurement of the length of the Union and Central Pacific roads under a resolution of Congress have completed their work. It is said that there is but a trifling difference between the length as measured by them and that fixed by the original survey.

Indianapolis, Cincinnati & Lafayette.

The entrance of this road into Cincinnati is constructed in the bed of the old Whitewater Canal. Recently suit has been brought against the company by several persons who claim to be creditors of the old Whitewater Canal Company, principally for right of way and lands sold. They ask to have their claims established as liens upon the property of the railroad company as successor to the old canal company.

North Louisiana.

This new company was fully organized at a meeting held in Shreveport, La., Nov. 18. The board of directors resolved to open books for subscriptions to the stock, and to receive subscriptions payable in money or land. Committees were also appointed to canvass for subscriptions along the proposed line of the road.

Wyandotte, Kansas City & Northwestern.

The City Council of Kansas City, Mo., having refused to grant this company the right of way through the city to the Union depot and stock yards, the company has announced its intention to build an elevator and transfer depot at Independence, 10 miles from Kansas City, and to transfer all its east-bound and through business to the Missouri Pacific at that point.

Central Pacific.

All the trestles on the line between Dutch Flat, Cal., and Auburn have been filled in except one near Cape Horn. At several points the line is being slightly changed and improved either in grade or curvature.

White River.

The contract for the construction of this road from Rochester, Vt., to Bethel has been let, but it is now said that nothing will be done, the Central Vermont having failed to give the aid expected.

New York Central & Hudson River.

The company this week ordered 300 new box cars, intended for use in carrying grain between Buffalo and the New York elevator, which latter is expected to be ready for use before the close of the year.

Dividends.

Dividends have been declared by the following companies:

New York, New Haven & Hartford, 5 per cent., semi-annual, payable Jan. 2.

Northern (New Hampshire), 2½ per cent., semi-annual, payable Dec. 1.

Chicago, Milwaukee & St. Paul.

Counterfeit 7.3 per cent. bonds, Prairie du Chien Division, have been discovered in New York, were they were offered for sale by a broker. The broker and the man from whom he obtained them were arrested, but both claim to have obtained them and offered them for sale in good faith, and there appears to be no evidence that they were connected with the forgers.

The bridge over the Mississippi near La Crosse, Wis., connecting the La Crosse Division with the River Division leading to Winona and St. Paul, is completed and was opened for business Nov. 28. It has been under construction for some time, and before the work was begun there was a long and somewhat bitter controversy as to its location, the company preferring the one finally chosen, while the La Crosse people desired it to be built directly opposite their city. The bridge will be used also by the trains of the Chicago, Dubuque & Minnesota road to reach La Crosse.

Chicago & Lake Huron.

The tracklayers working from Flint, Mich., westward have reached a point 30 miles from Flint and 16 miles east by north from Lansing. It is expected that the gap will be closed in December, so that cars can run through from Chicago to Port Huron by the close of the year.

Kansas Pacific.

The Court has made an order directing the Receivers to pay all amounts due for labor, material and supplies used in operating the road. This will enable them to pay the wages and supply bills due by the company at the time of their appointment.

Connecticut & Passumpsic Rivers.

Notice is given that the bonds and coupon notes of this company which mature Dec. 1, will be paid at the Treasurer's office, No. 7 Merchants' Exchange, Boston, on and after that date, and interest on them will cease from that date. If the holders so desire, they may exchange their securities for the new 7 per cent. first-mortgage bonds of the company.

Waterville & Washington.

Construction trains on this road are now running for 10 miles west of Waterville, Kan., and tracklaying, which has been much delayed by wet weather, is progressing steadily. The road is an extension of the Central Branch, Union Pacific.

Bristol, Doylestown & Milford.

It is proposed to build a narrow-gauge road from Bristol, Pa., northwest to Doylestown and thence west by north to Milford, about 30 miles in all. The road would serve to carry to the Philadelphia market much milk and garden truck from the farms of Bucks County, and would pass through a very fertile and prosperous country, most of which, however, is not very far from existing roads.

Duxbury & Cohasset.

It is stated that the town of Scituate, Mass., has sold its stock (750 shares) in this company to President Stearns, of the Old Colony Company at 6%. This purchase gives the Old Colony a controlling interest, which will, it is thought, prevent the building of the proposed extensions from Kingston to Middleboro and Tremont.

Springfield, Jackson & Pomeroy.

The Scioto Valley road is delivering to this company at Jackson, O., a large lot of bridge timber and 1,500 tons of rails. Tracklaying will soon be began at Jackson and pushed forward to Waverley as fast as possible.

Spartanburg & Asheville.

The first lot of iron for this road has been delivered at Spartanburg, S. C., and tracklaying from that point is to be begun at once.

Portland & Ogdensburg.

In the suit brought to compel the town of Lunenburg, Vt., to issue bonds voted in aid of the Essex County Railroad, now part of this line, the Vermont Supreme Court has refused to grant a *mandamus* against the selectmen of the town, on the ground that the statute has not been fully complied with in the proceedings for voting the bonds.

Manchester & Ashburnham.

Two meetings have been held in Manchester, N. H., to organize this company, but no definite action has been taken on account of the failure of a committee appointed at the first meeting to obtain any satisfactory assurances from the merchants of Manchester. A third meeting was to be held Nov. 29. The charter will expire by limitation if the company is not organized by Jan. 1.

Columbus & Toledo.

The track of this road is now completed to Walbridge, O., 117 miles north by west from Columbus. From Walbridge to Toledo, five miles, permanent arrangements have been made with the Pennsylvania Company for the use of the track of the Toledo & Woodville road into Toledo, also for the use of the depot and yard in that city. The connection at Walbridge is still to be put in and the northern end of the road ballasted before regular trains are put on, but it is probable that the road will be in operation by the end of the year. Nearly all the depot buildings on the line are completed or in progress, and the telegraph line is up from Columbus to Carey, with the poles distributed the rest of the way. The work of ballasting is being pushed.

Florida Through Trains.

A meeting of railroad managers was held in Jesup, Ga., Nov. 18, at which were represented the Florida Central, the Jacksonville, Pensacola & Mobile, the Atlantic & Gulf, the Atlantic, Gulf & West India Transit, the Central of Georgia, the Macon & Brunswick, the Port Royal, the Savannah & Charleston, the Montgomery & Eufaula and the roads forming the Atlantic Coast Line. It was agreed to run a line of through sleeping coaches between Louisville and Jacksonville, as was done last winter; also to put on a Florida express train to run between New York and Jacksonville by Washington, Richmond, Weldon, Wilmington, Charleston and Savannah. The time between New York and Jacksonville by this train will be 58 hours; the distance, all rail, is 1,173 miles, making an average speed of 20 miles an hour over the whole line, without allowance for stops, though north of Washington it is much more than that.

Raleigh & Augusta Air Line.

Track is now laid to a point 86 miles southwest from Raleigh, N. C., leaving only 12 miles to lay to complete the road to the Carolina Central, which it will reach at Hamlet, 7 miles east of Rockingham. This 12 miles is all graded and the ties are distributed. Regular trains are now running to Manly, 69 miles from Raleigh. The completion of the road to Hamlet will make a new line from Raleigh to Charlotte 197 miles long, or 23 miles longer than that of the North Carolina road.

St. Louis & Southeastern.

Gen. S. H. Wilson, Receiver, gives notice that holders of Receivers' certificates of the Tennessee Division will receive $25 on account of each coupon due Dec. 1, on presentation of the certificates at the Continental National Bank, New York.

Great Southern.

Some time since this company executed a mortgage for $30,000,000, proposing from the proceeds of the bonds to build a road from Millen, Ga., southward to the Southern extremity of Florida. A contract was made with Haas & Co., who were to sell the bonds by a sort of lottery arrangement. The public let the bonds severely alone and the company resolved to cancel the mortgage and start again. Now, however, one Weble, assignee of Haas & Co., brings suit to enjoin the company from canceling the mortgage or the contract. The case was argued in New York this week and decison reserved.

Nashville, Chattanooga & St. Louis.

The extension of the Jasper Branch, from Jasper, Tenn., to Victoria in the Sequatchie Valley, 7¼ miles, is now under contract, and the work is being pushed forward. As already noted, this extension is built by the company in pursuance of a contract with the Southern States Coal, Iron & Land Company, limited, an English corporation which is building extensive iron works at Victoria and South Pittsburgh.

The Nashville (Tenn.) *American* of Nov. 21 says: "A decree was entered in the United States Circuit Court yesterday against the old Nashville & Northwestern Railroad Company, for $866,000. The bill was filed to recover the value of the rolling stock and other material furnished to that company at the close of the war. The property so sold is supposed to have long since been worn out, and the probability is that but a very small part if any of the debt can be collected."

The Nashville & Northwestern is now part of the Nashville, Chattanooga & St. Louis, which company has heretofore settled its indebtedness to the United States. The judgment does not, it is said, form a lien on the road in its present relations.

Chicago, Rock Island & Pacific.

The board has decided to pay the dividends on the stock hereafter quarterly instead of half-yearly, as heretofore. The first dividend under the new arrangement will be paid Feb. 1.

On the extension of the Oskaloosa Branch westward track is now laid to Knoxville, Ia., 24 miles west from Oskaloosa and 127 miles from the junction with the Main Line at Wilton. A further extension of 24 miles will complete the connection with the Winterset Branch at Indianola, and make a second or loop line from Wilton to Des Moines.

Toledo, Wabash & Western.

The Stockholders' Protection Committee has issued the following important notice:

"According to arrangements made between the gold mortgage bondholders and representatives of the stockholders, opposition to the confirmation of the sale of the road made at Toledo, June 10 last, has been withdrawn.

"The condition of this withdrawal is, that stockholders of the old company shall have the right to subscribe for stock of the new corporation to be organized, at the rate of $10 per share, payable in instalments of $2 per share, at intervals of three months, commencing Feb. 1, 1877, with interest from Nov. 1, 1876.

"The gold bond mortgage of $5,000,000 under this arrangement will be paid off and cancelled, and the new company will be relieved of the leased lines.

"Subscriptions, which will be received by the Purchasing Committee at No. 52 William street, must be made within thirty days from this date, or the stockholders will forfeit the right to take the new stock.

"The Protection Committee, having now fully discharged the trust confided to it, congratulates the stockholders upon this successful termination of a tedious and expensive lawsuit, and earnestly advises them to avail of the option thus secured.

"Full particulars of the reorganization will be made known at an early date, and meantime further information can be obtained of the Purchasing Committee at the office, No. 52 William street, New York."

The purchasing committee of bondholders makes the following announcement:

"In compliance with the terms of settlement between the holders of gold mortgage bonds and representatives of the stockholders, subscription books to the stock of the Wabash Railway Company have been opened by the undersigned trustees, and designated the Purchasing Committee, at No. 52 William street, New York.

"Shareholders of the Toledo, Wabash & Western Railway Company have the option of subscribing for stock in the new company upon the following terms and conditions:

"First: Surrender of the old certificates at the time of subscription in exchange for receipts of the Purchasing Committee, which will entitle the holder to stock in the new company, share for share, upon payment of $10 per share, in instalments of $2, payable as follows: Feb. 1, April 1, July 1, Oct. 1, 1877, and Jan. 1, 1878, with interest from Nov. 1, 1876, or the whole may be paid at once, at the option of stockholders.

"Second: Such subscription must be made within 30 days from this date or the stockholders will forfeit all right to the new stock.

"Third: If all of the stock is not subscribed within 30 days, those who have before subscribed to have the right to take a pro rata proportion of the balance not subscribed, for 20 days thereafter.

"The gold bond mortgage will be paid off and canceled by the $1,600,000 subscribed, and the bank debt will be extended over a period of five years. All lease obligations and contracts are removed, and the new company is thus substantially relieved of a burden of interest on more than $8,000,000 to which the old company was subjected.

"The road is in excellent condition throughout, with more than 200 miles of steel track, and its equipment is ample for the transaction of a very large business. The earnings of the present year, to Nov. 1, show a gain of $438,000, and the business of the entire year is estimated at $4,500,000. * * *

"As soon as the organization of the new company is completed, a plan for funding the overdue coupons of the mortgage bonds will be submitted to the bondholders, and it is proposed to resume interest on the first mortgages early in the ensuing year.

"The question of issuing bonds or other obligations for the subscription of $10 per share will be submitted to the stockholders of the new company.

"Thus reconstructed, and relieved of the difficulties against which the old company has so long struggled, it is safe to anticipate a prosperous future for the Wabash Railway Company."

The new company starts with 599 miles owned and 26.5 miles leased, these leases covering essential parts of the road. The bonded debt remaining on the road is about $17,700,000, or $29,500 per mile, and the bank debt above referred to is about $900,000.

The holders of the equipment bonds, who claim that they have a right to exchange their bonds for those of the gold mortgage issue, just foreclosed, met in New York Nov. 24 and appointed a committee with instructions to employ counsel and begin suit to enforce their rights.

Indianapolis, Bloomington & Western.

It is said that the United States Circuit Court has indefinitely postponed further consideration of the motion for the removal of General Wright and the appointment of a new receiver; also of General Wright's application to be relieved from the receivership.

Harrisburg & Potomac.

The Waynesboro (Pa.) *Record* says: "Ground has been broken on the line of the Harrisburg & Potomac Railroad in Guilford and Quincy townships. The work has been divided between Messrs. Henry Good, H. E. Wertz, and an old contractor, Mr. Marsh. Hands along the line of the road have been employed.

"In this township the work of canvassing for stock is going forward. Messrs. D. Geiser, George J. Balsley, Jacob Beaver, L. S. Forney, and Simon Lecron have been soliciting subscriptions.

"It was announced that a corps of engineers in the interest of the Cumberland Valley Railroad would run a line between Mount Alto and this place."

Baltimore & Ohio.

A singular mishap occurred last week on the Central Ohio Division, which is thus described by the Wheeling (W. Va.) *Intelligencer* of Nov. 25: "The timbers of the tunnel on the Central Ohio Division of the Baltimore & Ohio road, about six miles west of Bellaire, known as the Franklin tunnel, caught fire at an early hour yesterday morning from the sparks of a passing locomotive, and were still burning last evening. New timber had been put in the tunnel recently, which of course

will be a total loss. Over the tunnel is a four-foot seam of coal, which caught from the burning timbers, and was still burning at latest accounts. The steamer United was sent from this city early in the morning to the scene of the fire, and together with two steamers from Newark, Ohio, was kept hard at work all day throwing water upon the burning timbers. Fortunately the creek near by furnished an abundant supply of water. It is thought that the burning coal cannot be extinguished without great difficulty, if at all. The damage will no doubt be considerable, but as yet it is a matter of mere conjecture. Trains were delayed during the day, the burning tunnel making a transfer necessary at that point."

Geneva, Fornellsville & Pine Creek.

The reported sale of the section of this road from Geneva, N. Y., to Stanley to the Northern Central Company is denied by authority.

The directors at a recent meeting resolved to make arrangements to lay the track from Geneva to Stanley, the Northern Central crossing, this winter and to Naples in the spring. The road is graded to Naples.

Ohio & Kentucky.

The sale of this road, which was to take place in Covington, Ky., last week, was again adjourned to March 28, 1877, no bid over $50,000 having been made for the property.

Ohio Central.

At the adjourned meeting held in Lancaster, O., Nov. 17, the stockholders of this company (formerly the Atlantic & Lake Erie) voted to approve and confirm the contracts made with the Pittsburgh, Cincinnati & St. Louis and the Cincinnati & Muskingum Valley companies. These contracts provide for the use by the Ohio Central of certain tracks of the other companies and also refer to aid to be extended by them.

St. Paul & Pacific.

In the long and complicated suit of Wietjen against this company and others, involving the ownership of certain iron bought for this road and subsequently pledged by Jay Cooke & Co. as security, the New York Supreme Court has made an order directing that the suit be discontinued as against three of the defendants, the Buffalo & Jamestown Railroad Company, Jewett M. Richmond, trustee, and Russell & Moulton. The order further directs Mr. Richmond to pay from the money in his hands $64,289.56 principal and $1,803.94 interest to George F. Cutter, representing the Navy Department; to pay $3,210.44 to Russell & Moulton, and to keep the balance as compensation for his services.

Georgia.

The aggreement made between the striking engineers and Superintendent Johnson for the company included, as noted last week, the continuance of the pay at $3.50 per day. The company retained the new engineers engaged during the strike and made the following conditions:

"1. All new engagements to be held sacred and faithfully fulfilled.

"2. Any further services needed may be filled from the former employes, but on condition that when selected and taken into service they must comply with the rules of the company and engage in no more strikes prejudicial to the company's interests.

"In filling the deficiency the oldest employes unexceptionable in other respects shall be preferred."

These terms were accepted, and the men went to work with the exception of a few, whose engines had been taken by the new men. The adjustment was secured by Mr. Robert H. May, of Augusta, who offered his services as mediator when the difference between the two parties was apparently beyond reconciliation.

Montclair & Morristown.

It is reported that arrangements have been made to organize a company to build the road from Montclair, N. J., westward to Morristown, about 16 miles, which was originally projected and partly graded as a branch of the Montclair Railroad. It is said that Mr. Adam Driesbach, of Reading, Pa., is to have the contract, and that he has already begun to prepare for the work.

Western North Carolina.

The commissioners who manage this road for the State report that it was transferred to them by the Receiver Oct. 1, 1875. During the year ending Sept. 30, 1876, the business of the line was as good as in former years, though the pleasure travel to the mountains was very much less than usual, owing, it is believed, to the Centennial. The account for the year is as follows:

Gross earnings ($831 per mile)		$94,759 47
Working expenses (64.82 per cent.)		61,419 16
Net earnings ($292 per mile)		$33,340 31
Paid for construction	$18,934 85	
Paid to State Penitentiary Board	6,171 69	
		25,106 54
Balance		$8,233 77

Of this, $2,529.23 is in the treasury and $5,704.54 due from agents. The commissioners have at work on the road 300 male and 16 female convicts, whose work is satisfactory. With 500 convicts they believe that they can grade the road to Asheville in another year and to the Tennessee line at Paint Rock in two years. A State tax of 10 cents on each $100 valuation for two years would furnish means to complete the road to Paint Rock. They recommend that a statutory lien on the property in favor of the State for all money expended be provided for by the Legislature.

In his annual message to the Legislature, Gov. Brogden, of North Carolina, says of this road:

"The Western North Carolina Railroad property, franchises, including road-bed, superstructure, equipment and all its real and personal estate, was sold at public sale, at the Court House in Salisbury, on the 22d day of June, 1875. After the sale was duly confirmed by the Circuit Court, and a good and lawful title conveyed to the State, I appointed Wallace W. Rollins, of Madison; W. S. Pearson, of Burke, and Wm. P. Canaday, of New Hanover, and took a separate bond for $25,000 with sufficient security from each Commissioner, to protect the interest of the State. The act provides that said Commissioners shall have such convicts as are not necessary for completing the penitentiary for laborers upon the unfinished portion of the Western North Carolina Railroad as they may require, and may use such portion of the net earnings of the road in its construction as they may deem proper.

"By order of the Circuit Court of the United States for the sale of the Western North Carolina Railroad, the purchaser was required to pay $10,000 in cash on the day of sale, which was done. As soon as a perfect and indefeasible title to said road could be secured to the State, and as soon as the necessary arrangements could be made for taking care of convicts, they were put to work on the road. The Directors of the Penitentiary have furnished the Commissioners of the Western North Carolina road additional convicts at different times amounting to 332. More might have been put to work on that road, but the law requires the Penitentiary to feed, clothe and guard them, and it has been impracticable for the Penitentiary to support the large and increasing number of convicts out of the limited appropriation for that purpose made by the last General Assembly.

"No appropriation was made for an active and vigorous prosecution of this great State work which has been too long neglected, and which is destined to be of vast importance to the people of North Carolina. Soon after he had purchased this road and commenced work upon it with the limited means at our command, some of the liberal and patriotic citizens of Wilmington, actuated by a commendable spirit of State pride, which has ever characterized the leading men of that city, voluntarily contributed $10,000, which paid for iron enough to lay about three miles of new track of the Western North Carolina Railroad."

Both parties in the recent election favored the completion of the road, and a good many members of the present Legislature are pledged in favor of it, so that it is probable that a fair appriation to carry on the work will be made.

Port Royal.

The Georgia Railroad Company, which disputes the validity of its indorsement on $500,000 of the bonds of this company, has given notice as follows:

"By direction of the board of directors of this company, notice is hereby given that the Georgia Railroad & Banking Company will not recognize any liability as guarantors of any bonds of the Port Royal Railroad Company, the owners of which are not parties to the proceedings to foreclose the mortgage on the Port Royal Railroad, which is now advertised to be sold.

"This notice is not intended to admit any liability on the part of this company, but to require holders of bonds to look to the Port Royal Railroad Company first, before seeking to charge this corporation."

Utica & Ilion.

A meeting was held in Utica, N. Y., Nov. 22, at which Mr. Lewis Lawrence stated that he had had a survey made from Genesee street in Utica eastward to Ilion, following for most of the distance the line of the Erie Canal and taking in the Franklin & Ilion street railroad between those two places. The distance is 11¾ miles and the estimated cost for a road of 3-ft. gauge was: for the road, $82,211; equipment, $28,000. He believed that such a road, running frequent trains, could secure a large passenger business, enough to pay a fair interest on the cost, and that a considerable freight and coal business could be secured besides.

There was some discussion over the matter, one or two present doubting whether the money could be raised just now. One gentleman thought it would be better to build a light road but of 4-ft. 8½ gauge, which could then take coal cars direct from the Delaware, Lackawanna & Western. The general opinion was that the road would pay and would be of much value to the towns on the line. Finally a committee was appointed to consult with the Franklin & Ilion Street Railroad Company and make other preliminary arrangements.

Texas Air Line.

A meeting was held in Atlanta, Cass County, Texas, Nov. 15, to organize this company. It proposes to build a line from Longview, Tex., north by east to Texarkana, about 80 miles. The line is not very far from that of the Texas & Pacific from Marshall to Texarkana, and the object in building it is not very clear, unless it is in the interest of the International & Great Northern, to make it independent of the Texas & Pacific.

Red River & Rio Grande.

Work has been begun on the grading of this road. The contractors have a considerable force on some heavy cutting near Denison, Texas.

Texas Western.

The track is now completed to and across the Buffalo Bayou bridge, 30 miles from Houston, Tex. From that point to Lagrange, 35 miles, work is to be pushed, and much of the grading is done.

Waco, Fairfield & Palestine.

The preliminary survey is completed from Waco, Tex., to the proposed junction with the International & Great Northern, 1½ miles south of the Trinity River crossing. The distance is 90 miles, and the line is said to be a very good one. Subscriptions are now being canvassed for along the line with very good success.

East Line & Red River.

The second section of 10 miles has been completed, which carries the road to Hickory Hill, 20 miles northwest from Jefferson, Texas. The contractors have begun work on a third section of 10 miles. An additional engine and a number of cars have been ordered and will soon be ready.

International & Great Northern.

The track is now laid and trains are running to Austin Summit, two miles east of Austin, Tex., and seven miles west of the late terminus at Duval. The depot at Austin is being built, but it is thought that it will take two weeks to finish the two miles of track yet required to reach it.

Galveston, Harrisburg & San Antonio.

The track on this road is now laid to Santa Clara, Tex., 10 miles west of the late terminus at Marion. The grading is done to the Cibolo River, 14 miles further and only six miles from San Antonio, and the track is expected to reach the Cibolo in December. The abutments for the iron bridge there have been begun.

Mobile & Girard.

The trouble between the stockholders of this company and the Central Railroad of Georgia, as set forth in the bills filed by certain stockholders, is as follows: The Central Company indorsed $250,000 Mobile & Girard bonds, on condition that one-half of the stock of the company should be conveyed to it. This was done, and ever since the board of directors has been composed of the nominees of the Central. Under this arrangement the stockholders claim that the management has been entirely in the interest of the Central, to the great detriment of the other road. They claim that business has been diverted to the Western Railroad, and charge also that the Central has secured a large judgment against the road and seeks to have it sold in satisfaction thereof, and that there is danger of its causing the first mortgage to be foreclosed. They ask the Court to order an account and settlement, and to enjoin the Central Company from proceeding under the judgment until such account and settlement shall have been had; also for a rescision of the contract for the transfer of stock, and an injunction to restrain the Central from voting on its stock.

Northern Central.

The Baltimore *Sun* of Nov. 22 says: "An agreement was filed for record in the clerk's office of the Superior Court yesterday between B. F. Newcomer, William T. Walters and Samuel M. Shoemaker, trustees, on the one part, and the Northern Central Railway Company, by its President, Thomas A. Scott, on the other part. The object of the agreement was to declare of record the amount of bonds now due and outstanding, issued by virtue of a mortgage of the company for $2,500,000, of Dec. 20, 1855. This total amount has been reduced to $1,490,000. The bonds so reduced were as follows: $763,500 held by the trustees of the sinking fund under said mortgage, and $166,500 by the commissioners of the general sinking fund up to June 19, 1874. Since then additional bonds for $80,000 have been purchased and cancelled by said trustees. The bonds now outstanding are 1,288 bonds of $1,000 each, and 404 of $500 each, amounting to $1,490,600, as stated, and the mortgage now stands as security for that amount."

Notice is given that the $500,000 York & Cumberland bonds which mature Jan. 1, 1877, will then be paid at the First National Bank of Baltimore, and that all interest thereon will cease from that date. Any holder of these bonds desiring to exchange them for the company's 6 per cent. consolidated bonds, on the basis of par for each, may do so by presenting them at the Treasurer's office in Baltimore on or before Dec. 10.

Cincinnati, Avondale, Glendale & Hamilton.

At a meeting of the corporators held Nov. 18 it was reported that there was a strong feeling in favor of building the proposed suburban line out of Cincinnati. Committees were appointed to go over the proposed line and see what could be done towards securing right of way; also to prepare a plan for stock subscriptions.

Monadnock.

At the annual meeting in Peterboro, N. H., Nov. 22, the President reported that the debt had been reduced from $102,800 to $95,000. From Oct. 1 the rental to be paid by the Boston, Barre & Gardner Company for the road is $15,000 per annum, which will pay interest on the debt and 4 per cent. on the stock. The stockholders voted that this 4 per cent. should be paid in two semi-annual dividends, in January and July. They also voted to authorize the board to subscribe for $10,000 stock and $10,000 bonds of the new Petersboro & Hillsboro road.

Coldwater, Marshall & Mackinaw.

The stockholders at a recent meeting voted to authorize the directors to issue $2,000,000 in bonds for the purpose of completing the road, and to take such other steps as they might think best to secure the same object. It was also voted to change the northern terminus from Elm Hall in Montcalm County to Mt. Pleasant in Isabella County, Mich., the last-named point being about 125 miles northward from Marshall.

Marietta & North Georgia.

Work on the grading is progressing steadily. Enough stock has been subscribed to grade and tie the road from Marietta, Ga., to Murphy, N. C., and the company hopes to get some aid from the State of Georgia to purchase the iron.

Ithaca, Auburn & Western.

Under this name the bondholders who bought the Western extension of the New York & Oswego Midland have organized a new company. Surveys have been made for the extension of the road from Scipio, N. Y., northward to Auburn, about 15 miles. It is said that a contract for the grading has been let to Grinnell Burt, of Goshen, N. Y., and that work will be begun very soon.

Concord.

This company has ordered a reduction in the wages of its enginemen to 3 cents and the firemen to 1¾ cents per mile. The majority of the men do not run over 70 miles a day, which would make the wages $2.10 and $1.22½. The enginemen have been getting $2.75 and $2.87½ per day. They object to the reduction and have appointed a committee to confer with the officers of the company, but without result as yet.

Chicago, Clinton & Western.

An exchange says: "Work has been suspended on the Clinton end, and nothing will be done until the courts decide whether the tax voted in aid of the road can be collected. Receiver Thayer is confident that the decision will be favorable to the railroad, and if so the eastern end of the line will be completed in the early Spring."

Vermont & Canada.

Vermont papers give currency to a report that a compromise between this company and the Central Vermont has been agreed upon. But at a hearing before a committee of the Vermont Legislature last week both parties were represented by counsel and some pretty plain talk was indulged in, the Central Vermont counsel accusing the other party of a selfish and factious opposition to an equitable adjustment, while the Vermont & Canada representatives characterized the plan of reorganization as an offer to give their clients 50 per cent. of the face value of a stock which ought to be worth par, and that in absolutely valueless paper. All of which did not look very much like an amicable adjustment. It may be noted that the reports of a compromise seem to come from Central Vermont sources, and may possibly be intended to influence Vermont Central bondholders to agree to the plan of reorganization.

The lower house of the State Legislature has refused a third reading to the bill to incorporate the Vermont Central second-mortgage bondholders, and also to the bill to authorize the Vermont & Canada to buy the Vermont Central. This action probably kills both bills for the session. It seems probable that no legislative action will be taken, which puts the whole matter over for two years, as the Vermont Legislature meets only every second year.

Northern, of Nebraska.

A company by this name has been organized to build a railroad from the Union Pacific at Sidney, Neb., to Custer City in the Black Hills. The incorporators include several Philadelphia parties who are said to control capital.

Harlan Branch.

It is proposed to build a railroad from Harlan, the county seat of Shelby County, Iowa, southward down the West Nishnabotna River to the Chicago, Rock Island & Pacific road near Avoca, about 10 miles. It is thought that if the road is graded arrangements can be made with the Rock Island Company iron and work it.

Mount Ephraim & Blackwoodtown.

The stock of this company is nearly all subscribed, and arrangements are being made to begin work shortly. The road is to be of 3 ft. gauge and will extend the Camden, Gloucester & Mt. Ephraim road from Mt. Ephraim, N. J., southward to Blackwoodtown, about six miles.

Milwaukee, Lake Shore & Western.

The grading of the long proposed extension from Appleton, Wis., northwest to New London, 20 miles, connecting with the Green Bay & Minnesota road, is now substantially completed, and the track is laid from Appleton west by north 10 miles to Hortonville. It is expected that trains will run to New London before the end of December.

Rock Island & Mercer County.

The track is now laid to Richland Grove Station in Mercer County, Ill., 13 miles southward from the junction with the Peoria & Rock Island road at Milan. Work is progressing and the road will probably be completed this year, about eight miles of track remaining to be laid.

Bangor & Piscataquis.

A called meeting of the stockholders was held in Bangor, Me., Nov. 21, when the committee previously appointed reported that under the lease to the European & North American the earnings of the road had not been kept separately. From May 1, however, a separate statement had been made, and for the four months to Aug. 31 the figures were: Gross earnings, $29,341.19; expenses, $16,238.55; net earnings, $13,102.64. Three plans for the management of the road were suggested: To lease it for a fixed proportion of earnings; to operate it separately but under charge of the European & North American officers, paying a fair proportion of their salaries, and lastly to run it as a separate road altogether.

After some discussion a committee was appointed to see on what terms the European & North American would continue to run the road. The meeting then adjourned until evening, when the committee reported that the European & North American had offered to work the road one year for 60 per

cent. of the gross earnings. After more discussion the committee was continued and directed to negotiate further with the lessees; also to report the probable cost of working the road separately, and to make an inventory of the property of the company. The meeting then adjourned to Nov. 27, when the committee is to report.

ANNUAL REPORTS.

Old Colony.

This company, during its last fiscal year, ending Sept. 30, 1876, worked the following lines, of which it owns directly all but the Fall River, Warren & Providence and the Milton Branch, and of those two it is the real owner, holding all the stock:

	Miles.	
Main Line, Boston, by Taunton to Newport, R. I.	67.79	
South Braintree to Plymouth	25.94	
South Braintree by Middleboro to Main Line at Somerset Junction	37.60	
Cape Cod Division, Middleboro to Provincetown	86.77	
Total Main Line and extensions		217.10
Milton Branch	3.30	
Granite Branch	5.51	
Shawmut Branch	2.35	
Bridgewater Branch, Abington to Bridgewater	6.99	
Easton Branch	1.69	
Wood's Hole Branch, Cohasset Narrows to Wood's Hole	17.54	
Hyannis Branch, Yarmouth to Hyannis	4.90	
Middleboro & Taunton Branch	8.04	
Fall River Bridge connection	2.06	
		52.38
Fall River, Warren & Providence R. R.	5.79	
Total		275.27

The Fall River Bridge connection and the Fall River, Warren & Providence road were worked from Dec. 1, 1875. The Granite Branch was extended 2.41 miles, from Quincy to Braintree, during the year, the extension being worked about half the year. The company substantially owns the South Shore road, from Braintree to Cohasset, 11.55 miles, and controls the Duxbury & Cohassett road, from Cohasset to Kingston, 20.81 miles, but their accounts are kept separately. Of the main line, 11.35 miles are double track.

This system of roads serves to carry almost the entire traffic of all that section of Massachusetts east of the Boston & Providence road, the only line not controlled by this company which enters that district being the Boston, Clinton, Fitchburg & New Bedford's New Bedford line. The company also owns a controlling interest in the Old Colony Steamboat Company, whose lines run from Fall River and Newport to New York.

The company owns a half interest interest in and works the Union Freight Railroad, which connects its track and that of the Boston & Providence (the joint owner) with other roads entering Boston.

The equipment consists of 47 passenger, 15 freight and 7 switching engines; 147 passenger and 25 baggage cars; 321 long box, 10 short box, 339 long flat, 13 short flat, 24 stock, 72 six-wheel stone and 498 coal and gravel cars. During the year four engines, two passenger, 14 freight and 20 coal cars were added; two engines, one passenger, 21 freight, and 28 coal cars were built to replace old ones. The passenger equipment is all supplied with the air-brake and the Miller platform.

The capital account at the close of the year was as follows:

Stock ($24,263 per mile)	$6,733,800 00
Premium on stock	56,648 71
Bonds ($17,944 per mile)	4,939,500 00
Bills payable	997,321 54
Dividends unpaid	14,486 77
Income account	681,884 23
Total ($48,765 per mile)	$13,423,641 35

The assets include besides road and equipment, $36,937.88 in Dorchester & Milton Branch; $137,447.84 in South Shore stock; $348,565.43 in the Fall River, Warren & Providence Railroad; $70,400 in Union Freight Railway stock; $726,500 in Old Colony Steamboat stock, and $30,681.67 in Nantucket & Cape Cod Steamboat stock.

During the current year (Aug. 1, 1877) $1,450,000 of 7 per cent. bonds mature. The directors believe that these can be replaced by a 6 per cent. loan without difficulty, and they ask the necessary authority for the new issue. During the past year $1,000,000 bonds thus matured and an equal amount of new 6 per cent. bonds were sold at a premium.

The work of the year was as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passenger train mileage	929,579	922,510	Inc.. 7,069	0.8
Freight-train mileage	331,210	415,734	Dec. 24,524	5.9
Service train mileage	55,267	49,237	Inc.. 6,030	12.3
Total	1,376,056	1,387,481	Dec. 11,425	0.8
Passengers carried	4,150,457	4,286,720	Dec. 136,263	3.2
Passenger mileage	59,025,834	61,295,250	Dec. 2,269,686	3.7
Tons freight carried	619,663	625,768	Dec. 6,105	1.0
Tonnage mileage	17,896,799	18,371,231	Dec. 474,432	2.6
Average passenger-train load	63.50	66.44	Dec. 2.94	4.4
Average freight-train load	45.75	44.19	Inc.. 1.56	3.5

Of the passenger mileage 27.1 per cent., and of the tonnage mileage, 36.1 per cent. was of business to and from other roads. The coal tonnage carried was 131,502 tons, a decrease of 8,402 tons, or 6 per cent., from the previous year.

The earnings of the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P.c.
Passengers	$1,310,234 23	$1,372,607 10	Dec.. $62,372 87	4.5
Express, mail and extra baggage	99,354 55	109,804 90	Dec.. 10,450 35	9.5
Freight	712,929 09	741,479 69	Dec.. 28,550 60	3.9
Rents	24,663 15	24,848 86	Dec.. 185 71	0.7
Gravel and miscellaneous	59,099 35	37,733 35	Inc.. 21,966 00	58.3
Total	$2,206,880 37	$2,286,473 90	Dec.. $79,593 53	3.5
Working expenses	1,370,493 74	1,443,135 39	Dec.. 72,641 65	5.0
Taxes, State and local	106,033 61	110,609 02	Dec.. 4,575 40	4.1
Total	$1,476,527 35	$1,553,744 40	Dec.. $77,217 05	5.0
Net earnings	$730,353 02	$732,729 50	Dec.. $2,376 48	0.3
Gross earn. pr mile	$8,091	$8,500	Dec.. $409	4.8
Net " "	2,678	2,724	Dec.. 46	1.7
P. ct. working exps	62.10	63.12	Dec.. 1.02	1.6
" expenses and taxes	66.91	67.95	Dec.. 1.04	1.5

The income account was as follows:

Net earnings		$730,353 02
Premiums on bonds sold		23,700 00
Total		$754,053 02
Balance of interest account	$323,518 33	
Dividends, 6 per cent	402,807 00	
Notes charged to profit and loss	23,790 94	
		750,116 27
Surplus for the year		$3,936 75
Balance at close of previous year		677,947 48
Balance at close of year		$681,884 23

The interest account is credited with dividends on stock in the Old Colony Steamboat Company and with other interest received, which credits, deducted from interest paid, leaves the balance of account as above.

During the year 842 tons of steel, 659 tons new iron and 100,540 new ties were used in renewals; 1,704 tons of rails were taken up, repaired and relaid. Over 50 miles of track are laid with steel, and, believing the price to be as low as it is likely to be, the directors have contracted for 4,000 tons, to be delivered this winter. A new brick depot has been built at Taunton, the boiler shop at South Boston enlarged, a reservoir built at Wood's Hole, and a freight house on the Derrick Wharf at Fall River; 11,530 feet new sidings have been laid. These improvements and the new equipment have been charged to expenses.

The earnings have been affected by the depression in the manufacturing towns on the line, but an improvement has already begun. The New York business and that of the Old Colony Steamboat Company has been largely increased by the Exposition at Philapelphia, and the Steamboat Company paid 8 per cent. dividends for the year.

The report says, in conclusion: "We repeat what was said in our report for 1875, that apart from the payment of some outstanding claims for land damages our construction account may be regarded as closed. It is proposed to take steps for the consolidation into our corporation of the South Shore Railroad, the Fall River, Warren & Providence Railroad and the Dorchester & Milton Railroad, which we now substantially own."

James River & Kanawha Canal.

This company owns a canal extending from Richmond, Va., westward through the valley of the James River to Buchanan, 148 miles. A large share is owned by the State of Virginia, but the financial condition of the company is not good, the interest on its debt being in arrears. An application for a receiver was recently made to the Virginia courts, but has not yet been acted on.

For the year ending Sept. 30 the tonnage of the canal was: 1875-76, 191,424; 1874-75, 211,570; decrease, 20,146 tons, or 9.5 per cent. The revenue for the same period was:

	1875-76.	1874-75.	Increase.	P. c.
From tolls	$100,629 97	$93,397 66	$7,232 31	7.7
" Richmond dock	37,309 80	36,970 68	1,239 12	3.4
" water-rents	15,084 08	14,708 74	375 34	2.6
Total	$153,023 85	$144,177 08	$8,846 77	6.1
Revenue per mile	1,033 94	974 17	59 77	6.1

No account of expenses is given. The larger revenue derived from a smaller aggregate tonnage than that of 1875 is due to the increase in 1876 of freights of the higher classes. The gain in tobacco was 6,319 hogsheads, in wheat 42,062 bushels, and in flour 9,950 barrels. There was also a gain in merchandise, miscellaneous and other first, second and third-class freights; but a loss of more than 32,000 tons of coal, iron ore, oyster shells, lime, and other freights of the fifth and sixth classes.

The report urges the great importance of completing the Buchanan & Clifton Forge Railroad, which is to connect the canal with the Chesapeake & Ohio Railroad at Clifton Forge. From this connection a largely increased tonnage is expected, especially in coal, though it seems doubtful whether the Chesapeake & Ohio would be willing to turn any of its through coal business over to the canal, and the local coal demand is already supplied from the mines near Richmond. A considerable passenger business is done on the canal, regular passenger boats running on its Western section. These afford an outlet to Lynchburg and thence to Richmond for Lexington and the Upper Shenandoah Valley.

Connecticut Western.

This company works a line from Hartford, Conn., west by north to Millerton, N. Y., 68 miles. The equipment consists of 9 engines, 17 passenger-train cars and 219 freight cars. It was increased during the year by 10 hay-cars at a cost of $6,500.

The amount of bonds outstanding is $3,000,000, or $44,118 per mile, and $200,000 more have been pledged as security for money borrowed to pay interest. The stock is largely held by towns on the line.

The passengers and freight carried for the year ending Sept. 30, 1876, were:

	1875-76.	1874-75.	Inc. or Dec.	P.c.
Passengers carried	194,842	209,697	Dec.. 14,855	7.1
Tons freight carried	133,564	109,671	Inc .. 23,893	21.8

The earnings for the year were as follows:

	1875-76.	1874-75.	Inc. or Dec.	P. c.
Passengers	$109,696 00	$120,765 79	Dec.. $11,067 79	9.2
Freight and milk	201,933 87	254,074 81	Dec.. 52,140 94	20.5
Mails and express	7,654 84	10,955 37	Dec.. 4,300 53	39.1
Total	$318,286 71	$385,795 97	Dec.. $67,509 26	17.5
Expenses	198,057 42	201,499 99	Dec.. 3,442 57	1.7
Net earnings	$120,229 29	$184,295 98	Dec.. $64,066 69	34.8
Gross earn. per mile	4,680 69	5,673 47	Dec.. 992 78	17.5
Net " "	1,768 08	2,710 43	Dec.. 942 35	34.8
Per cent. of expe	62.23	52.23	Inc . 10.00	19.1

The January interest paid was $105,000, and payments for rents, insurance and interest on loans during the year were $20,108.03, making a total of $125,108.03, and leaving a deficiency for the year of $4,878.74.

The annual interest charge on the bonds issued is $210,000, so that the net earnings were some $80,000 short of the amount required. The July coupons were not paid, and if the interest remains in default over six months the road is liable to pass into the hands of the State Treasurer. The directors, to avoid this, propose to call a meeting of the bondholders shortly and submit to them a plan for funding some of their coupons. It is believed that the business of the road will increase and that the building of the Poughkeepsie Bridge will bring to it much new traffic, which will make it a paying road.

Accidents Caused by Negligence of Employes.

The following is a report by the Massachusetts Railroad Commissioners called out by the late collision at Ballardvale, but referring to a number of accidents of late occurrence due to similar causes:

This was a case of collision between a way freight train and certain freight cars standing on a side track at Ballardvale Station on the Boston & Maine Railroad. The Dover way freight train is timed to pass Ballardvale at 11:55 a. m. On the 17th of November this train, consisting of 43 cars drawn by two locomotives, was somewhat late, and the engine-driver in charge of the leading locomotive, while rounding the curve before reaching Ballardvale at a speed of some fifteen miles an hour, perceived that the switch was misplaced in such a way that his train must inevitably be thrown on to the siding and brought into collision with two freight cars standing upon it, one of which was empty while the other was loaded with coal. Both locomotives were at once reversed and the call for brakes given, but the interval was not sufficient to permit the stopping of the train. In the consequent collision the two standing freight cars and both the colliding locomotives were thrown from the track, and a number of cars in the freight train were piled upon the latter, and subsequently caught fire, both they and their contents being destroyed. The engine-driver and fireman of the first locomotive jumped from it before the collision and escaped with slight injuries; those of the second locomotive were both killed, and a brakeman was thrown from the top of a freight car, having a leg broken and foot crushed in his fall.

The accident was due to the carelessness of a section-master, who, fifteen minutes before the freight train was due, had opened the switch to the siding and a second switch leading on to a spur track off the siding. After running the car he was using on to the spur track he had closed the second switch and forgotten to close the first one, thus leaving the main track broken. The man had been in the employ of the corporation twenty years and was considered thoroughly trustworthy.

The Commissioners wish in connection with this disaster to call the attention, not only of the Boston & Maine, but of all other railroad corporations of the State, to the very alarming frequency with which accidents like that at Ballardvale have of late occurred. It is impossible to specify any cause to which this fact is due, but it is nevertheless indisputable that at no time since the organization of this board in 1869 have so many disasters been reported within the same space of time as since the 31st day of August last. A great proportion of these also seem to have been due, like that of Ballardvale, to gross and inexplicable carelessness on the part of employes long in the service of the companies and considered thoroughly reliable.

The following is a list of the accidents referred to in the order in which they happened:

August 31. A collision occurred at Newburyport on the Eastern Railroad between a locomotive running over the road northward and the Bangor express train on its way to Boston. This accident was occasioned by the gross carelessness of both the conductor and engine-driver of the Bangor train, who, though having themselves receipted for the dispatch notifying them that the extra engine was on the road before them, inexplicably left Newburyport without waiting for it.

September 1. A collision occurred at Wachusett on the Vermont & Massachusetts Division of the Fitchburg Railroad, between the Cheshire express train and a Fitchburg "mixed train," consisting of 26 freight and one passenger cars. In this case the mixed train, having frequent stops to make, during which freight was to be delivered from or put on to it, was followed by the express passenger train at an interval of ten minutes, and the only method in use of signaling to the latter the amount of time by which it was preceded by the former was singularly primitive. As the express passenger train passed the station at Westminster the station-master was in the custom of holding up his hand with as many fingers extended as minutes had elapsed since the freight train had passed. That such a method of signaling should be found in use at this late period of railroad development affords a much more reasonable ground for surprise than that, being in use, it should have at last resulted in disaster.

This collision caused the death of the first passenger killed on a railroad in this State from causes wholly beyond his own control since the 14th of January, 1874, a period of over two years and seven months. Besides this person, however, one other passenger was injured and two cars were badly broken.

September 12. A collision occurred at Chester on the Boston & Albany Railroad between a freight train and the passenger express train from Albany. The freight conductor being unable to get his train on to the siding in time to avoid the Albany express, sent a flagman back to stop it. This man went some 3,300 feet before meeting the coming train, the engineer of which, none the less, failed to stop it in time to avoid a collision, in which a number of freight cars and the engine, tender and baggage car of the passenger train were thrown from the track and much damaged. No lives were lost or personal injuries sustained. In this case, although the train had to be stopped on a down grade, the space of 3,300 feet should have been amply sufficient for the purpose, and the collision was unquestionably due to the carelessness of its engineer, who neglected to make full use of his train brake.

October 10. A collision occurred at North Andover, on the Boston & Maine Railroad, between a freight train and a portion of another freight train, which had been left standing on the track while the train-men were getting other cars from a siding. An engine and six cars were thrown from the track, which also was torn up, but no personal injuries were sustained. This accident was due to the carelessness of a flagman from the freight train at the station, who neglected to go back a sufficient signaling distance from it.

October 13. A collision occurred at Randolph on the Old Colony road between the steamboat express train from Newport and a freight train which was being placed on a siding. In this case those in charge of the freight train accidentally heard through the telegraph operator that the steamboat train was a few minutes behind its regular time. Presuming on this circumstance they took the risk of occupying the main track several minutes after that train was due, and this without sending out a flagman. They had finished their shunting and were in the act of backing the train on to the siding, when the steamboat train, consisting of two powerful locomotives and fourteen cars, came at great speed round the curve. Nothing but the excellent construction of the rolling stock prevented this from being one of the most disastrous railroad accidents on record. Even as it was, it resulted in the death of one of the employes of the company and serious injuries to three others, while both locomotives of the passenger train, and its baggage, mail and smoking cars, and the locomotive and two cars of the freight train were either totally demolished or very badly shattered. This accident was due to the gross carelessness of those in charge of the freight train, and their willful disregard of the distinct rules of the road.

October 26. A collision occurred at Millville on the Providence & Worcester road, between a passenger train and a portion of a freight train which had been separated from the rest in switching. In this case the brakeman on the detached portion of the freight train, which was left standing on a curve after nightfall, ran back to signal the following passenger train. In doing so he fell, breaking and extinguishing the light in his lantern, so that he was unable to attract the attention of the engine-driver of the following train, except by throwing his lantern through the cab window of the locomotive. This he did, but the train could not be stopped in time to prevent a collision, though the shock was greatly reduced. No one was injured.

November 1. A collision occurred at East Braintree, on the South Shore Branch of the Old Colony Railroad, between a passenger train and a local freight train standing upon a siding. Like that at Ballardvale, this accident was due to the careless misplacement of a switch by the station master at East Braintree, who, having set the switch properly once, subsequently went back and changed it, apparently in mere absence of mind. It resulted in the death of one employe and injury to two others, while the locomotive of the passenger train and several cars of the freight train were more or less broken.

That such a series of accidents as the above should have occurred is far from creditable to the railroads of Massachusetts; and the circumstances connected with several of them indicate an alarming laxity of discipline among employes of companies which have heretofore been most fortunately exempt from such disasters. That they have not resulted in most serious loss of life is obviously due to the greatly increased use during late years of the Miller system of car construction and the Westinghouse brake; indeed, the death of the single passenger which happened, there can be little doubt, would have been prevented had the locomotive of the colliding train at Wachusett been equipped with the train brake, as the cars of the train were. The cars, however, belonged to the through line by which the train brake had been adopted, while the locomotive belonged to the Cheshire road which still relied on the old hand brakes. Meanwhile the Commissioners now call the attention both of the public and of the railroad officials and employes to the fact that these disasters have occurred in quick succession, in the hope that by so doing they may prevent the occurrence of others.

CHARLES F. ADAMS, JR.,
A. D. BRIGGS,
FRANCIS M. JOHNSON,
Railroad Commissioners.

BOSTON, Nov. 23, 1876.